The Chemical Age

VOL. LXXVI No. 1943

6 October 1956

ATOMIC POWER

(See page 23)

It's

"Metal Containers" Age

METAL CONTAINERS LTD., 17 WATERLOO PLACE, PALL MALL, LONDON

WORKS: ELLESMERE PORT & RENFREW. ASSOCIATED COMPANIES OVERSEAS

WELLS OIL FILTERS

With a Wells' waste oil filter you can use your oil several times over and change it more often. A thoroughly reliable supply of is assured with the use of W special filter pads which wor conjunction with Wells' pa syphon feed. The oil deliv from a Wells' filter can be with complete confidence.

Write for fuller particulars of filters

Delivery of Oil Filters and Special "Wells' Filter Pads from Stock"

Also makers of

OIL CABINETS, BARREL POURERS & PORTABLE PARAFFIN HEATER PLANTS, SPRAY GUNS & LIME SPRAYERS

A. C. WELLS & CO.

LIMITED

HYDE • CHESHIR

Tel: HYDE 953 · *Grams:* UNBREAKABLE, HYD

A C T I C

CECA

ACTIVATED CARBONS FOR EVERY

WAVY

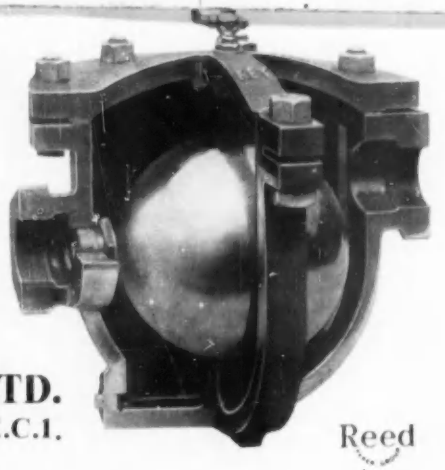
"Simp

Steam Traps

cannot jam or blow steam. Unique in design, foolproof in operation.

"Simplicity" Steam Traps have only one moving part—a free floating stainless steel sphere.

Each trap is guaranteed. Send for a trap on trial. Write for fully descriptive pamphlet, No. ST9A.



THE KEY ENGINEERING CO. LTD.

4 Newgate Street, London, E.C.1.

Telephone: City 1185/6/7

and at Trafford Park, Manchester, 17

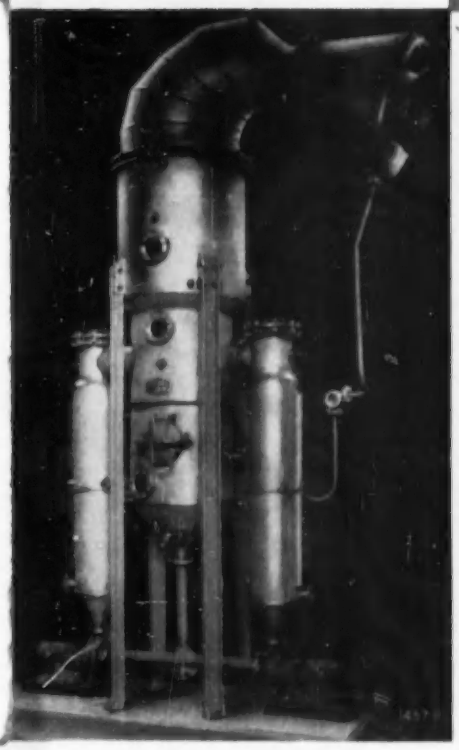
KEY

Reed

Telephone: Trafford Park 2056/7

COMPLETE FACTORY

PAGES



staff in all stages of a project, often beginning as early as pilot scale development.

Photograph 1457.P is a Stainless Steel, Forced Circulation, Vacuum Evaporator designed for treating a heat-sensitive product. Steam at reduced pressure provides a minimum temperature on the heating side. For special technical reasons two heating calandrias are fitted. The equipment includes a high-efficiency entrainment separator.

Discuss it with— W.J. FRASER & CO. LTD.

CHEMICAL ENGINEERING CONTRACTORS · HAROLD HILL · ROMFORD · ESSEX
Telephone: Ingrebourne 3940 (14 lines). Works: Monk Bretton, Barnsley, Yorks.
TAS/FS/457A

WELLS OIL FILTERS

With a Wells' waste oil filter you can use your oil several times over and change it more often. A thoroughly reliable supply of oil is assured with the use of Wells' special filter pads which work in conjunction with Wells' patent syphon feed. The oil delivered from a Wells' filter can be used with complete confidence.

Write for fuller particulars of these filters

Delivery of Oil Filters and Special "Wells' Filter Pads from Stock"

Also makers of

OIL CABINETS, BARREL POURERS & PORTABLE PARAFFIN HEATER PLANTS, SPRAY GUNS & LIME SPRAYERS

A. C. WELLS & CO.

LIMITED

HYDE • CHESHIRE

Tel: HYDE 953 · *Grams:* UNBREAKABLE, HYDE

ACTICARBONE

CECA

ACTIVATED CARBONS FOR EVERY APPLICATION

INFORMATION & QUOTATIONS ON REQUEST

THE BRITISH

CECA

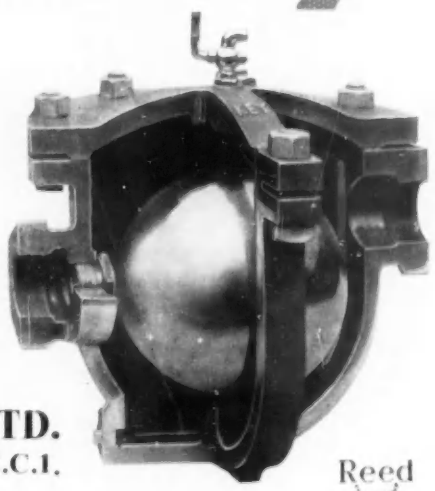
COMPANY LTD

175 PICCADILLY LONDON W.1.

Tel. HYDE PARK 5131-5 Cables, ACTICARBONE, LONDON

"Simplicity"

Steam Traps



cannot jam or blow steam. Unique in design, foolproof in operation.

"Simplicity" Steam Traps have only one moving part—a free floating stainless steel sphere.

Each trap is guaranteed. Send for a trap on trial. Write for fully descriptive pamphlet, No. ST9A.

THE KEY ENGINEERING CO. LTD.

KEY

4 Newgate Street, London, E.C.1.

Telephone: City 1185/6/7

and at Trafford Park, Manchester, 17

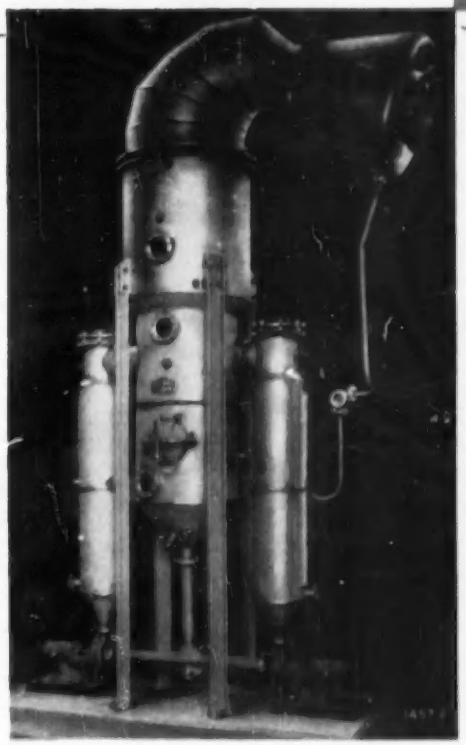
Reed

Telephone: Trafford Park 2056/7

COMPLETE FACTORY

or individual plant

Fraser's offer wide, up-to-date experience in the design and engineering of process plant—on all scales, from the small, specialised item to the complete factory or refinery unit. Our engineers and designers can collaborate with clients' own staff in all stages of a project, often beginning as early as pilot scale development.



Photograph 1457.P is a Stainless Steel, Forced Circulation, Vacuum Evaporator designed for treating a heat-sensitive product. Steam at reduced pressure provides a minimum temperature on the heating side. For special technical reasons two heating calandrias are fitted. The equipment includes a high-efficiency entrainment separator.

Discuss it with— W.J. FRASER & CO. LTD.

CHEMICAL ENGINEERING CONTRACTORS · HAROLD HILL · ROMFORD · ESSEX
Telephone: Ingrebourne 3940 (14 *lines*). *Works: Monk Bretton, Barnsley, Yorks.*
TAS/FS/457A

INDEX TO ADVERTISERS

The first figures refer to advertisement in **The Chemical Age Year Book**, *the second to the current issue*

Page		Page
283	A.P.V. Co., Ltd., The	—
216	Acalor (1948) Ltd.	—
277	Accrington Brick & Tile Co., Ltd., The	—
229	Adequate Weighers Ltd.	—
270	Aimer Products Ltd.	—
158	Albany Engineering Co. Ltd. The	—
	Alexander, Herbert, & Co., Ltd.	13
	Alginate Industries Ltd.	—
178	Allen, Edgar, & Co., Ltd.	—
370	Alumina Co., Ltd., The	—
366	Amalgamated Oxides (1939) Ltd.	—
186	Angel, H. Reeve, & Co., Ltd.	—
	Armour & Co., Ltd.	—
G/Cd.	Ashmore, Benson, Pease & Co.	—
289	Ashworth, Arthur, Ltd.	—
386	Audley Engineering Co., Ltd.	—
146	Autometric Pumps Ltd.	—
190	B. A. Holland Engineering Co., Ltd., The	—
295	Baird & Tatlock (London) Ltd.	—
171	Baker Perkins Ltd.	—
350	Baker Platinum Division, Engelhard Industries Ltd.	—
225	Balfour, Henry, & Co.	—
222	Barclay Kellett & Co., Ltd.	—
215	Bennett, Sons & Shears Ltd.	—
G/Cd.	Berk, F. W., & Co., Ltd.	—
282	Beryllium & Copper Alloys (Safety Tools) Ltd.	14
263	Blundell & Crompton Limited	—
148	Borax Consolidated Ltd.	—
	Borax & Chemicals Ltd.	—
237	Boulton, William, Ltd.	—
236	Bowmans Chemicals Ltd.	—
290	Braby, Fredk., & Co., Ltd.	—
231	Bramigk & Co., Ltd.	—
252	Brannan, S., & Sons, Ltd.	—
211	Bristol's Instrument Co., Ltd.	—
	British Acheson Electrodes Ltd.	—
232	British Arca Regulators Ltd.	—
268	British Assoc. of Chemists The	—
	British Carbo Norit Union Ltd.	—
	British Ceca Co., Ltd., The	cov. ii
292	British Chrome & Chemicals Ltd. (London)	—
254	British Chrome & Chemicals Ltd. (Lancs)	—
	British Drug Houses Ltd., The	—
	British Electrical Development Association	—
8	British Industrial Solvents	—
234 & 235	British Laboratory Ware Association Ltd.	—
233	British Labour Pump Co., Ltd.	—
239	British Lead Mills Ltd.	—
Spine	British Resin Products Ltd.	—
372	British Railway Traffic & Electric Co., Ltd.	—
256	British Rototherm Co. Ltd. The	—
166	British Steam Specialties Ltd.	—
236	British Tar Products Ltd.	16
	British Thomson-Houston Co. Ltd.	—
292	British Titan Products Co., Ltd.	—
180	Broadbent, Thomas, & Sons, Ltd.	—
191	Brooks & Walker Ltd.	—
209	Brotherhood, Peter, Ltd.	—
232	Brotherton & Co., Ltd.	—
	Brough, E. A., & Co., Ltd.	—
214	Browns Foundry Co., Ltd.	—
260	Brush Design Group, The	—
274	Bryan Donkin Co., Ltd., The	—
290	Buell (1952) Ltd.	—
273	Burnett & Rolfe Ltd.	—
	Bush, W. J., & Co., Ltd.	—
213	Butterfield, W. P., Ltd.	—
	Calder Vale Glassworks Ltd.	2
	Callow, F. E. (Engineers) Ltd.	—
	Callow Rock Lime Co. Ltd. The	—
364	Candy Filter Co., Ltd., The	—
264	Carbon Dioxide Co., The	—
	Chapman & Hall Ltd.	8
207	Chemical Workers' Union, The	—
	Chemicals & Feeds Ltd.	8
354	Chemitrade Ltd.	—
275	Chesterfield Tube Co., Ltd., The	—
297	Ciech Ltd.	—
248	Cinema Television Ltd.	—
244	Clark, T. C., & Co., Ltd.	—
173	Clayton Dyestuffs Co. Ltd. The	—
176	Clayton, Son & Co., Ltd.	—
	Clydesdale Chemical Co. Ltd. The	16
183	Cole, R. H., & Co., Ltd.	—
238	Cole & Wilson Ltd.	—
196	Collins Improved Firebars Ltd.	12
356	Comet Pump & Eng. Co. Ltd. The	—
	Costain-John Brown Ltd.	—
256	Crockatt, W., & Sons, Ltd.	—
	Cromil & Piercy Ltd.	39
169	Cruickshank, R., Ltd.	—
328	Cyanamid Products Ltd.	—
250	Cyclops Engineering Co. Ltd. The	—
254	Cygnet Joinery Ltd.	—
298	Danks of Netherton Ltd.	—
238	Davey, Paxman & Co., Ltd.	—
	Dawson, McDonald & Dawson Ltd.	—
330	Derby Luminescents Ltd.	—
177	Dorr-Oliver Co., Ltd.	—
248	Douglas, William, & Sons Ltd.	—
250	Dowlow Lime & Stone Co., Ltd., The	—
	Dring & Fage Ltd.	2
258	Drummond Patents Ltd.	—
257	Dryden, T., Ltd.	—
280	E.C.D., Ltd.	—
259	Electrothermal Engineering Ltd.	—
B/Mk.	Elliott, H. J., Ltd.	—
211	Elliott Brothers (London) Ltd.	—
230	English Glass Co., Ltd., The	—
G/Cd.	Erinoid Ltd.	—
296	Evered & Co., Ltd.	—
	Ewart, M. D., & Co., Ltd.	—
288	Farnell Carbons Ltd.	—
228	Feltham, Walter H., & Son Ltd.	—
230	Ferris, J. & E., Ltd.	—
264	Film Cooling Towers (1925) Ltd.	—
211	Fisher Governor & Co., Ltd.	—
159	Foster Instrument Co., Ltd.	—
227	Foxboro-Yoxall Ltd.	—
	Fraser, W. J., & Co., Ltd.	1
314	Fuller's Earth Union Ltd., The	—
182	Gallenkamp, A., & Co., Ltd.	—
	Geigy Co., Ltd., The	—
276	Geigy Pharmaceutical Co., Ltd.	—
	General Electric Co., Ltd.	—
243	Grazebrook, M. & W., Ltd.	—
226	Greeff, R. W., & Co., Ltd.	—
222	Grindley & Co., Ltd.	—
226	Hackbridge & Hewittic Electric Co., Ltd.	—
240	Haller & Phillips Ltd.	—
266	Hanovia Lamps	—
218	Harris (Lostock Gralam) Ltd.	—
258	Haworth, F. (A.R.C.) Ltd.	—
161	Hearson, Charles, & Co., Ltd.	—
220	Herbert, Alfred, Ltd.	—
	Holmes, W. C., & Co., Ltd.	—
194	Honeywill & Stein Ltd.	—
279	Hopkin & Williams Ltd.	—
4	Huntington, Heberlein & Co. Ltd.	—
	Imperial Chemical Industries Ltd.	5
157	Imperial Smelting Corporation (Sales) Ltd.	—
	International Combustion Group	—
	Isopad Ltd.	—
278	Jackson, Henry (Liverpool) Ltd.	—
382	Jackson, J. G., & Crockatt Ltd.	—
185	Jenkins, Robert, & Co., Ltd.	—
187	Jenkinson, W. G., Ltd.	—
3	Jobling, James A., & Co., Ltd.	—
210	Johnson, G. T., & Co., Ltd.	—
206	Johnsons of Hendon Ltd.	—
201	Jones, Tate & Co., Ltd.	13
216	K.D.G. Instruments Ltd.	—

continued on page 4

CALDER VALE GLASSWORKS LTD

Calder Vale Rd. • Wakefield • Yorks

TEL. WAKEFIELD 3857

● SPECIALISTS IN ●

Carboys · Demijohns Winchesters

Established 1725

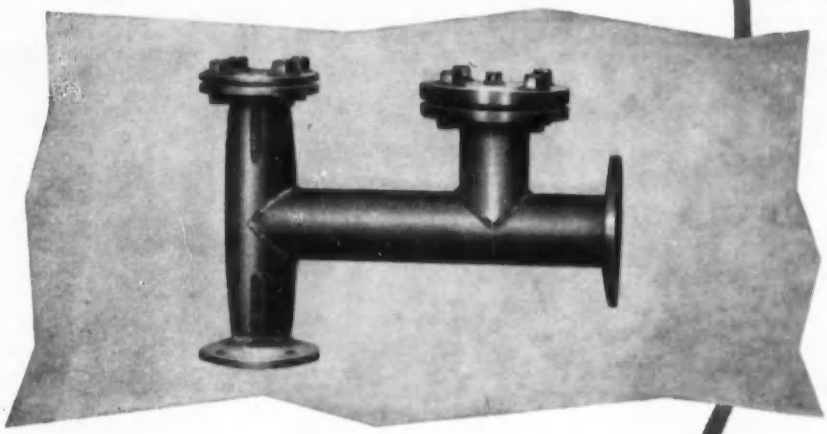
By Appointment to the Board of Customs & Excise

Telephones
Hop 3618
Hop 4793

Hydrometers, Thermometers Gauging Instruments and Graduated Glassware

DRING & FAGE LTD.
150 - 152 TOOLEY STREET
LONDON S.E.1

PLEASE SEND FOR OUR LATEST CATALOGUE



fabricated & manipulated steel tubing

Most pipework systems must be 'made-to-measure', to suit the particular requirements of the installation, and Wards have the experience and the facilities for supplying pipework and tubing specials for all types of steam, air, and water systems.

This is only part of the service that INDUSTRIAL PLANT DEPARTMENT has to offer—a service which includes the construction and supply of such things as jacketed pans, autoclaves, air and steam receivers, coolers condensers and all manner of static plant for general usage.

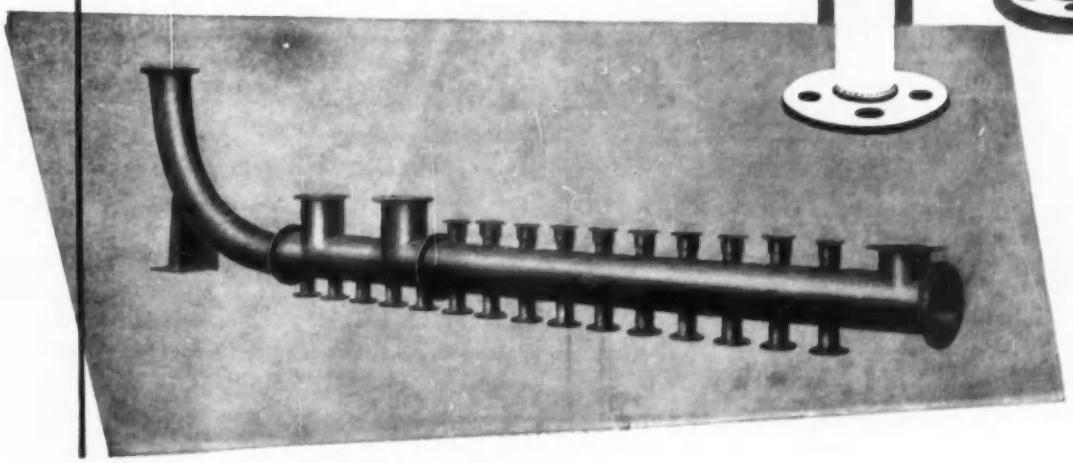
INDUSTRIAL PLANT DEPARTMENT,

THOS. W. WARD LIMITED

ALBION WORKS SHEFFIELD TEL. 26311 (22 LINES)

and

BRETTENHAM HOUSE, LANCASTER PLACE, STRAND, W.C.2. TEL. TEM 1515



INDEX TO ADVERTISERS

The first figures refer to advertisement in **The Chemical Age Year Book**, *the second to the current issue*

Page		Page
266	K.W. Chemicals Ltd.	—
	Kaylene (Chemicals) Ltd.	—
2	Keith Blackman Ltd.	—
284	Kernick & Son Ltd.	—
403	Kestner Evaporator & Engineering Co., Ltd.	4 & 43
	Key Engineering Co. Ltd. The	cov. ii
160	Kier, J. L., & Co., Ltd.	—
288	Kingsley & Keith Ltd.	—
267	Kleen-e-ze Brush Co., Ltd.	—
193 & 269	Klinger, Richard, Ltd.	—
202	Lankro Chemicals Ltd.	—
198	Laporte Chemicals Ltd.	—
192	Lavino (London) Ltd.	—
221	Leda Chemicals Ltd.	44
	Leeds & Bradford Boiler Co., Ltd., The	—
204	Leigh & Sons Metal Works Ltd.	—
	Leitch, John W., & Co., Ltd.	—
	Lennig, Charles, & Co. (Great Britain) Ltd.	—
	Lennox Foundry Co., Ltd.	—
	Ley, M.	—
	Light, L., & Co., Ltd.	10
376	Lind, Peter, & Co., Ltd.	—
Cover	London Aluminium Co. Ltd. The	—
300	London Metal Warehouses Ltd.	—
284	Lord, John L., & Son	cov. iv
	MacLellan, George, & Co., Ltd.	—
199	Mallinson & Eckersley Ltd.	—
380	Marchon Products Ltd.	—
263	Marco Conveyor & Eng. Co. Ltd.	—
192	Matthews & Yates Ltd.	—
	May & Baker Ltd.	—
162	Measuring & Scientific Equipment Ltd.	—
330	Meigh Castings Ltd.	33
168	Metal Box Co., Ltd., The	—
Cover	Metal Containers Ltd.	front cover
	Metal Industries Ltd.	—
	Metalfiltration Co., Ltd., The	9
G/Cd.	Metalock (Britain) Ltd.	—
228	Metcalf & Co.	—
	Metropolitan - Vickers Electrical Co., Ltd.	cov. iv
198	Middleton & Co., Ltd.	—
	Mills Packard Construction Co. Ltd.	—
261	Mine Safety Appliances Co. Ltd.	—
	Mirrlees Watson & Co. Ltd. The	—
260	Mirvale Chemical Co., Ltd.	—
253	Mitchell, Cotts & Co., Ltd.	—
	Mond Nickel Co., Ltd., The	7
	Monsanto Chemicals Ltd.	41
	Moore, W. & E., Ltd.	—
196	Moritz Chemical Engineering Co., Ltd.	12
	Morgan Crucible Co., Ltd., The	—
252	Murphy, G. L., Ltd.	—
197	National Enamels Ltd.	—
217	Neckar Water Softener Co. Ltd.	—
181	Nederlandsche Verkoopkantoor Voor Chemische Producten N.V.	—
206	Nederlandse Emballage Ondeerneming Gebr. de Wilde N.V.	—
262	Negretti & Zambra Ltd.	—
164 & 165	Newton Chambers & Co. Ltd.	—
271	Nicolson, W. B. (Scientific Instruments) Ltd.	—
175	Nordac Ltd.	—
299	North Thames Gas Board	—
204	Northern Malleable Foundry Co., Ltd., The	—
	Northey Rotary Compressors Ltd.	—
	Northide Ltd.	—
306	Palfrey, William, Ltd.	—
	Paper Goods Manufacturing Co., Ltd.	cov. iii
	Pascall Engineering Co. Ltd. The	37
6	Paterson Engineering Co. Ltd. The	—
203	Peabody Ltd.	—
	Penhryn Quarries Ltd.	—
310 & 338	Permutit Co., Ltd., The	39
	Pott, Cassels & Williamson	—
334	Powell Duffryn Carbon Products Ltd.	—
G/Cd.	Power-Gas Corporation, Ltd. The	—
259	Press at Coombelands, Ltd., The	—
170	Price Stutfield & Co., Ltd.	—
	Prodorite Ltd.	—
320	Production Chemicals (Rochdale) Ltd.	—
	Pyrethrum Board of Kenya	35
	Q.V.F. Ltd.	—
287	Reads Ltd.	—
	Richmond Welding Co., Ltd.	—
	Robinson, F., & Co., Ltd.	—
G/Cd.	Rose, Downs & Thompson Ltd.	—
208	Rotometer Manufacturing Co. Ltd.	—
362	St. Helens Cable & Rubber Co. Ltd.	—
249	Sandiacre Screw Co., Ltd., The	—
210	Scientific Glass-Blowing Co. The	—
	Shaw Petrie Ltd.	—
286	Shawinigan Ltd.	—
340	Shell Chemical Co., Ltd.	6
247	Siebe, Gorman & Co., Ltd.	11
360	Sigmund Pumps Ltd.	—
	Simon, Richard, & Sons, Ltd.	—
320	Southern Instruments Computer Division	—
348	Spencer Chapman & Messel Ltd.	—
280	Spesco (Developments) Ltd.	—
	Stabilag Co., Ltd., The	—
404	Stanton Instruments Ltd.	—
	Staveley Iron & Chemical Co. Ltd.	11
208	Steel, J. M., & Co., Ltd.	37
194	Stockdale Engineering Co., Ltd.	—
	Stonehouse Paper & Bags Mills	—
	Streamline Filters Ltd.	12
	Sturge, John & E., Ltd.	—
245	Sutcliffe Speakman & Co., Ltd.	—
242	Taylor Rustless Fittings Co. Ltd.	—
174	Tenaplas Sales Ltd.	—
282	Thermal Syndicate Ltd., The	—
324	Thermix Industries Ltd.	—
	Thomason, W., & Sons Ltd.	4
145	Thompson, John (Dudley) Ltd.	—
	Thorium Ltd.	—
	Todd Bros. (St. Helens & Widnes) Ltd.	—
219	Towers, J. W., & Co., Ltd.	—
191	Trent Valve Co., Ltd.	—
286	Tungstone Products Ltd.	—
293	Unifloc Ltd.	—
	United Coke & Chemicals Co. Ltd.	—
172	United Filters & Engineering Ltd.	—
244	W.E.X. Traders Ltd.	—
291	Walker Extract & Chemical Co. Ltd.	—
	Wallach Bros. Ltd.	8
184	Waller, George, & Son Ltd.	—
246	Walley, A. L.	—
190	Wallis, Charles, & Sons (Sacks) Ltd.	—
	Ward, Thos. W., Ltd.	3
200	Watford Chemical Co., Ltd.	—
188	Watson, Laidlaw & Co., Ltd.	—
344	Webb, William A., Ltd.	—
195	Wells, A. C., & Co., Ltd.	cov. ii
224	Wengers Ltd.	—
218	Whitaker, B., & Sons Ltd.	—
285	Widnes Foundry & Engineering Co., Ltd.	—
241	Wilkinson Rubber Linatex Ltd.	—
223	Willcox, W. H., & Co., Ltd.	—
214	Wilson, Edward, & Son Ltd.	—
189	Winn & Coales Ltd.	—
212	Wood, Harold, & Sons Ltd.	—
246	Worcester Royal Porcelain Co., Ltd., The	—
	Worthington-Simpson Ltd.	—
179	Wynn (Valves) Ltd.	—
251	Yorkshire Tar Distillers Ltd.	—
240	Zeal, G. H., Ltd.	9

KEEBUSH

Keebush is an acid-resisting constructional material used for the contruction of tanks, pumps, pipes, valves, fans, etc. It is completely inert to most commercial acids; is unaffected by temperatures up to 130°C; possesses a relatively high mechanical strength, and is unaffected by thermal shock. It is being used in most industries where acids are also being used. Write for particulars to—

KESTNER'S

5 Grosvenor Gardens, London, S.W.1

CHEMICAL LEADWORK

Fabricated Lead Sheets and Pipes. Homogeneous interior Lead lining of flanged mild steel tubes, bends, and tees.

W. THOMASON & SONS, LTD.

Walton Works, Great Moor Street, BOLTON

Established 1875 *Telephone 306*

What's in the tank?

I.C.I. Silicate of Soda—going to a detergent manufacturer. Silicates could be going to a textile-bleacher, to a contractor for soil-consolidation, or for clay deflocculation—in fact to any of the score of industries which use Silicates of Soda.

They could be going to YOU.

I.C.I. Silicates of Soda, backed by the fullest technical service, have helped many a manufacturer to improve his processes, cut his costs. To find out how they can help you, get in touch with:

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

ICI

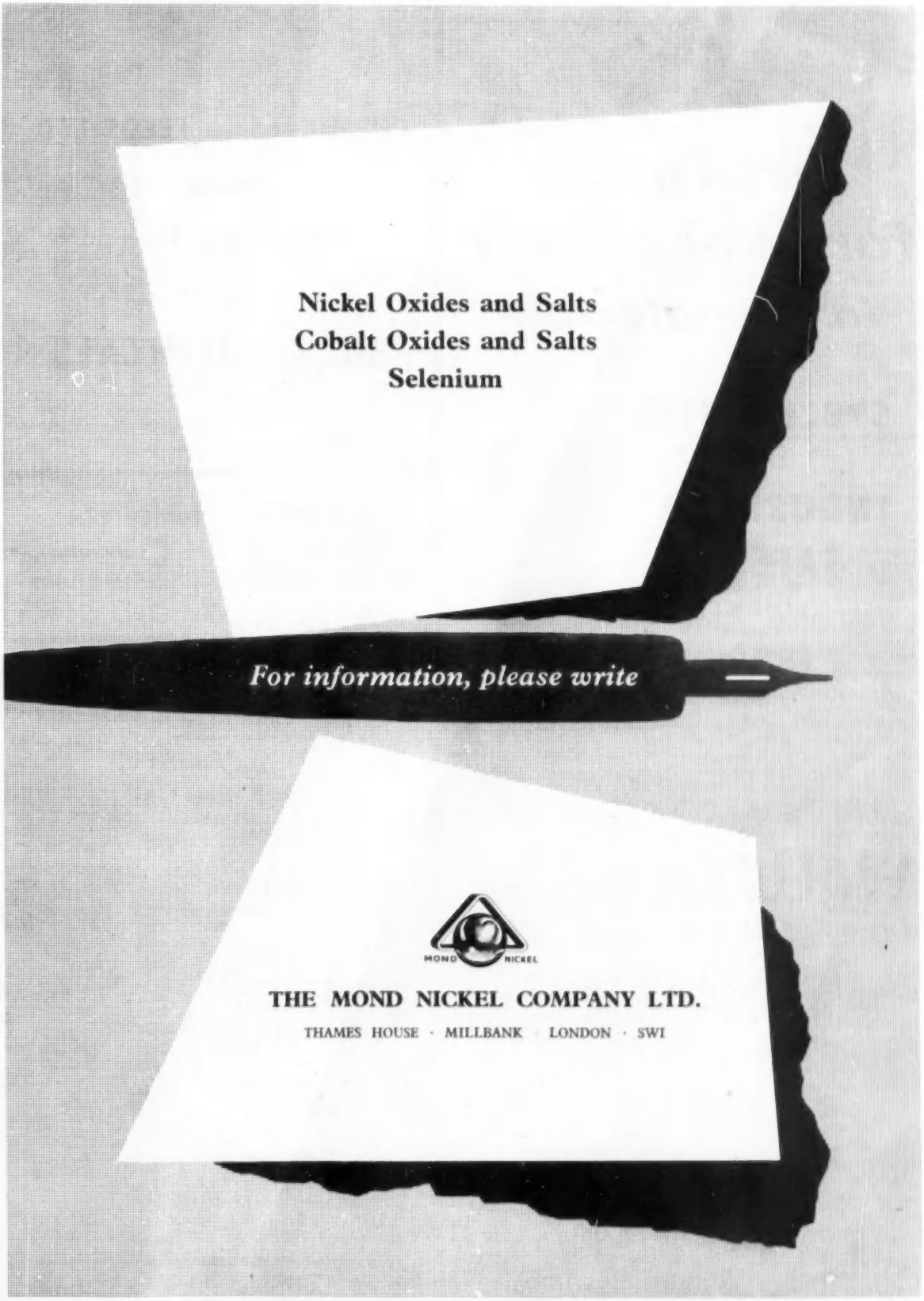
ASI

SO MANY JOBS FOR SILICATES BY I.C.I.

SHELL **Shell Chemical Company Limited**

Norman House, 105-109 Strand, London, W.C.2. Telephone : Temple Bar 4455

Sales Offices :
LONDON : Walter House, Bedford Street, W.C.2. *Tel: Temple Bar 4455.*
MANCHESTER : 144-146 Deansgate. *Tel: Deansgate 6451.*
BIRMINGHAM : 14-20 Corporation St., 2. *Tel: Midland 6954-8*
GLASGOW : 124 St. Vincent Street, C.2. *Tel: Glasgow Central 9561.*
BELFAST : 35-37 Boyne Square. *Tel: Belfast 20081.*
DUBLIN : 53 Middle Abbey Street. *Tel: Dublin 45775.*


Nickel Oxides and Salts
Cobalt Oxides and Salts
Selenium
For information, please write
MOND NICKEL
THE MOND NICKEL COMPANY LTD.
THAMES HOUSE · MILLBANK · LONDON · SWI

EVERTRUSTY

An Apron for Every Body in all materials

SPECIALISTS
IN
INDUSTRIAL
SAFETY
SINCE
1880

•

Manufactured by

WALLACH BROS.
LIMITED
49 TABERNACLE ST.
LONDON, E.C.2
Telephone CLErkenwell 1448/9

•

Members of the
ROYAL SOCIETY for
the PREVENTION
of ACCIDENTS

CHEMICALS and FEEDS LTD
invite
your enquiries
for
BULK CHEMICALS

ADELAIDE HOUSE, LONDON, E.C.4

TELEPHONE	TELEGRAMS
MANsion House 9621 (3 lines)	'Chemifeed', London

CHAPMAN & HALL

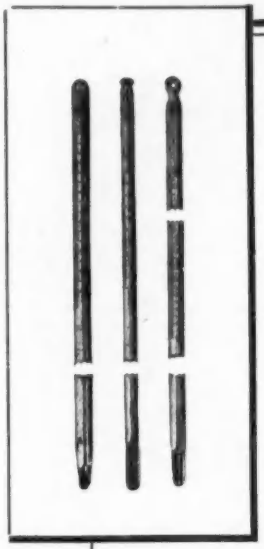
★ *New Books* ★

CHROMIUM
VOLUME I:
Chemistry of Chromium and its Compounds
Edited by
Marvin J. Udy
(Vice-President, Strategic-Udy Metallurgical & Chemical Processes Ltd.)
Size: 9¼" x 6" 446 pages Illustrated 88s. *net*

THE CHEMISTRY AND TECHNOLOGY OF WAXES
by
Albin H. Warth
(Wax Research Consultant, U.S.A.)
SECOND EDITION—REVISED
Size: 9¼" x 6" 948 pages Illustrated 144s. *net*

SODIUM
Its Manufacture, Properties and Uses
by
Marshall Sittig
(Ethyl Corporation, New York)
Size: 9¼" x 6" 537 pages Illustrated 100s. *net*

37 ESSEX STREET, LONDON, W.C.2

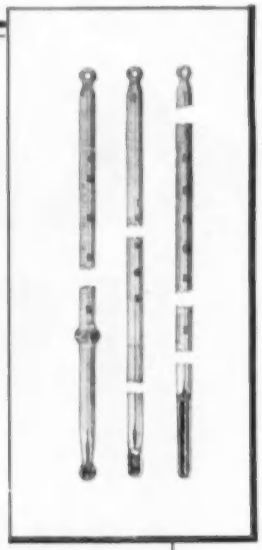


ZECOL
REG. TRADE MARK

THERMOMETERS

CHEMICAL THERMOMETERS

HYDROMETERS



'PHONE
LIBERTY
2283-6

G. H. ZEAL LTD.

'GRAMS
ZEALDOM
SOUPHONE
LONDON

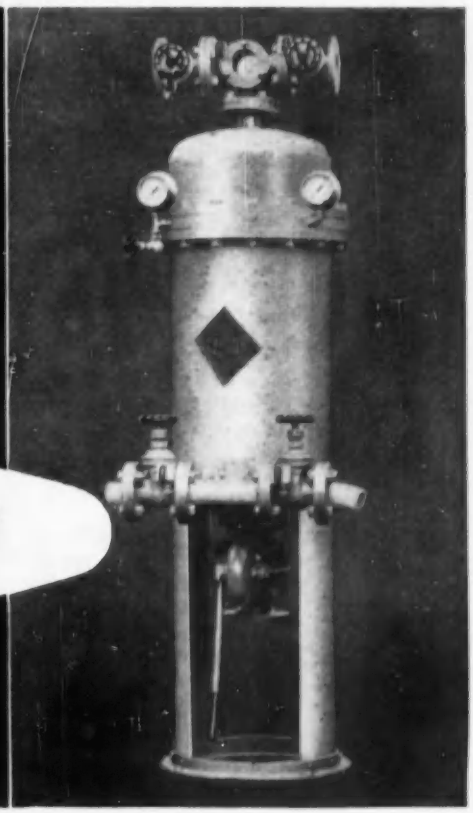
LOMBARD RD., MORDEN RD., MERTON, LONDON S.W.19

Metafilters secure the complete removal of suspended matter from any liquid at any temperature and pressure, giving an

OPTICALLY CLEAR FILTRATE

without oxidation, loss of solvent, or escape of fumes. Can be completely cleaned in a few minutes without opening up. Constructed without soldering, brazing, or welding.

A TYPICAL
METAFILTER
INSTALLATION



Sizes from 10 gallons to 10,000 gallons per hour in any metal.

THE METAFILTRATION COMPANY LIMITED
BELGRAVE ROAD HOUNSLOW MIDDLESEX
Phone: Hounslow 1121-2-3 Grams: Metafilter Hounslow

LIGHT'S 1956 catalogue lists:

AMINO ACIDS · PEPTIDES · ENZYMES
BIOCHEMICALS · BILE SALTS · STEROIDS
SURGARS · VITAMINS · ALKALOIDS
PURINES · PYRIMIDINES · NUCLEOTIDES
NUCLEOSIDES · HORMONES
SYNTHETIC DRUGS · INTERMEDIATES
REAGENTS · FLAVONES · CARCINOGENIC
HYDROCARBONS · SILANES · OLEFINS
ACETYLENICS · FLUOR-DERIVATIVES
NITRILES · FATTY ACIDS AND ALCOHOLS
FILTER ACIDS · SOLVENTS · METAL
HYDRIDES · ION EXCHANGERS
CHROMATOGRAPHIC AIDS

Please write for your copy to :

L. LIGHT & COMPANY LIMITED

POYLE · COLNBROOK · SLOUGH · BUCKS

SAFER with... Siebe Gorman

IN GASEOUS ATMOSPHERES, in Chemical, Gas and Refrigerating Plant, Siebe, Gorman equipment safeguards life and health. It covers all routine and emergency requirements, involving repairs, inspection and rescue.
Here are some typical applications:
SELF-CONTAINED BREATHING APPARATUS. Compressed air and oxygen types with durations from ½ hour to 2 hours.
RESPIRATORS of the filter type. "Puretha" Mark IV and "Gaspro" Gas Respirators. Also dust and fume masks.
SMOKE AND GAS HELMETS AND MASKS of the fresh air type. "Spirelmo", "Bloman", "Antipoys", etc.
RESUSCITATION APPARATUS. Oxygen types for asphyxia, electric shock, etc., including "Novox" and "Novita".
GAS DETECTION APPARATUS and Protective Clothing of all types.

Established 1819

SIEBE GORMAN & CO. LTD.

Neptune Works, Davis Rd., Chessington, Surrey
Telegrams: Siebe, Chessington *Telephone: Elmbridge 5900*

TGA 5G(C)2

the twelve labours

The first task of Hercules—the killing of the Hydra, a many headed water monster which lived in a vast swamp—was a team effort.

Hercules took his friend Iolus to help him. Whilst Hercules decapitated the heads with his brazen club, Iolus applied a firebrand to the headless stumps before the magical new heads could spring forth.

TEAM WORK PRODUCES

STAVELEY CHEMICALS FOR INDUSTRY

THE STAVELEY IRON & CHEMICAL CO. LTD. near CHESTERFIELD

CONTINUOUS SUPERPHOSPHATE DEN

FROM 3 TO 40 TONS PER HOUR

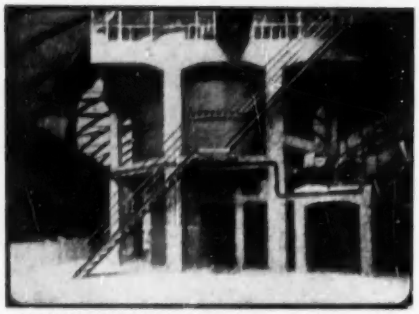
SULPHURIC ACID PLANTS

PYRITES & SULPHUR BURNERS

DUST PRECIPITATORS

GRINDING MILLS

SUNDRY CHEMICAL PLANTS



CONTINUOUS DEN: Output 25 tons hour

Phone : FROBISHER 0769

Grams : MORICHEMIC, LONDON

MORITZ

CHEMICAL ENGINEERING Co LTD

204, Earls Court Road, London, S.W.5

For all types of BOILERS

★

DURABILITY

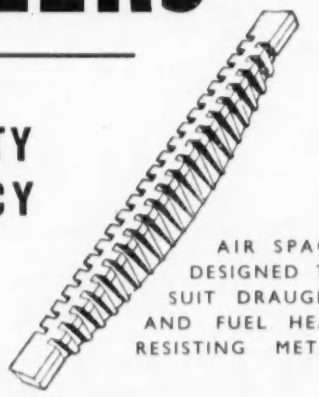
EFFICIENCY

Patents

207123

490306

581396



AIR SPACE DESIGNED TO SUIT DRAUGHT AND FUEL HEAT RESISTING METAL

COLLINS IMPROVED FIREBARS LTD.

51 · THE MALL · EALING · LONDON · W·5

Tel: EALING 4070

The crank shaft is the heart of the engine and the lubricating oil is its heart's blood.

Stream-Line filters enable first grade lubricating oil to be kept always perfectly clean and used over and over again, increasing running efficiency and effecting a big saving in overhauls and maintenance.

Over 50,000 users are proving the value of Stream-Line filters in the economical operation of i.c. engines.

STREAM-LINE FILTERS

Make oil lubricate longer

STREAM-LINE FILTERS LTD, INCATE PLACE, LONDON, S.W.8. TELEPHONE: MACAULAY 1011

COULD YOU GRIND

5 grams of iron ore to 300 B.S.S. mesh in 30 minutes

This is one of the many examples of the high performance of which this new machine is capable.

High speed grinding is particularly desirable for repetitive control sampling. Staff employed on tedious hand grinding are released to do more profitable work.

The machine will grind samples consistently to a given mesh size relying less upon the judgment and perseverance of the assistant.

Standard grinding members are of agate and ensure complete freedom from metallic contamination.

A Midlands works laboratory saves an average of 25 hours a week

IF NOT — YOU NEED AN

ALEXANDER *Electrical Pestle and Mortar*

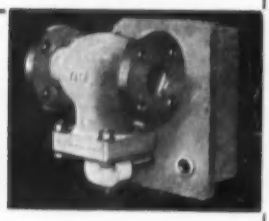
USED AS A MIXER

By substituting a stirrer and bowl for the pestle and mortar units, the machine is converted to a simple mixer in a matter of seconds.

Send a sample for test

HERBERT ALEXANDER & CO. LTD.
Hercules Engineering Works
Charmouth Street LEEDS 11
Phone: 20655 Grams & Cables: Alexson, Leeds 11

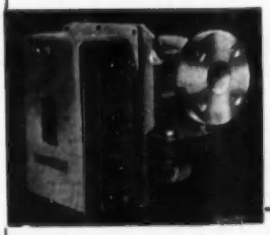
TATE SOLENOID-OPERATED SEMI-BALANCED VALVES



JONES, TATE & CO., LTD

VICTORY WORKS BRADFORD

TELEPHONE BRADFORD 28348/9 · TELEGRAMS VALVE, BRADFORD



RANGE ½" to 4" BORE 5 lbs to 200 lbs/□"
PRESSURE TOTALLY ENCLOSED

ALSO AVAILABLE WEATHERPROOF & FLAMEPROOF
FOR USE ON
STEAM, WATER, AIR, SPIRITS, OIL AND CHEMICALS

with

TELCON BERYLLIUM COPPER SAFETY TOOLS

Beryllium Copper Safety Tools, by reason of their comparatively high thermal conductivity, have little tendency to spark and can be employed with confidence in dangerous atmospheres. The great strength and hardness of these tools gives them a performance and length of life assuring their superiority in this field, and their best recommendation is their widespread use by major industrial concerns handling inflammable materials.

Distributors for Great Britain

BERYLLIUM & COPPER ALLOYS (SAFETY TOOLS) LTD.

47 VICTORIA ST., LONDON, S.W.1 ABBey 6421/2

Manufactured by

TELEGRAPH CONSTRUCTION & MAINTENANCE Co. LTD

TELCON WORKS · MANOR ROYAL · CRAWLEY · SUSSEX

VOL. LXXVI No. 1943
6 OCTOBER 1956

The international weekly chemical journal covering every aspect of industrial chemistry and chemical engineering

THE CHEMICAL AGE

OVERSEAS AGENTS

Argentina, Inter-Prensa, Florida 229, Buenos Aires • **Australia,** L. M. Cullen & Co. Pty. Ltd., 12 Howard Street, Perth. Gordon & Gotch (Australasia) Ltd., 262-264 Adelaide Street, Brisbane, Queensland. The Grahame Book Co., 39-49 Martin Place, Sydney, N.S.W. John Hinton & Co., 164 Pitt Street, Sydney, N.S.W. Jervis Manton Pty. Ltd., 190 Bourke Street, Melbourne C1. N.S.W. Bookstall Co. Pty. Ltd., Cnr. Market & Castlereagh Streets, Sydney, N.S.W. • **Belgium,** W. H. Smith & Son Ltd., 71-75 Boulevard Adolphe Max, Brussels • **Brazil,** Livraria Stark Ltda., Caixa Postal 2786, Sao Paulo • **British West Indies,** Christopher B. Hills, 101-103 Harbour Street, Kingston, Jamaica • **Canada,** W. H. Smith & Son (Canada) Ltd., 224 Yonge Street, Toronto • **Ceylon,** The City Stores Ltd., Kandy. The Lake House Bookshop, McCallum Road 10, Colombo • **Chile,** The E. S. Blair Company, Paris 803, Santiago • **Cyprus,** The Union Trading Co., P.O. Box 123, Larnaca • **Czechoslovakia,** Artia Ltd., 30 Ve Smeckach, Prague 11 • **Denmark,** Illustrated News Service, Dahlerupsgade 1, Copenhagen V • **Egypt,** S. S. Bassous, P.O. Box 109, Alexandria • **Finland,** Akateeminen Kirjakauppa, Helsinki. Rautatiekirjakauppa Oy., Helsinki • **Fiji,** A. A. Shameem & Co., P.O. Box 8, Suva • **France,** Paul Crampel, 54 Rue Rene Boulanger, Paris X • **Germany,** Buch und Zeitschriften-Union, Harvestehuder Weg 5, Hamburg 13. W. E. Saarbach G.m.b.H., 30, Gertrudenstrasse, Cologne 1 • **Holland,** Dekker en Nordemann's Wetenschappelijke Boekhandel N.V., O.Z. Voorburgwal 243, Amsterdam C. Meulenhoff & Co. N.V., 2-4 Beulingstraat, Amsterdam • **Hong Kong,** F. E. Skinner (Hong Kong) Ltd., P.O. Box 1066, Hong Kong • **India,** Biver & Co., 11 Maharaja Tagore Road, Calcutta 31. J. M. Jaina & Bros., Mori Gate, Delhi. Manufacturers' Eastern Agency, P.O. Box 301, 105 Apollo St., Bombay. L. V. Paramesh, 32 T.S.V. Kovil Street, Mylapore, Madras, 4 • **Indonesia,** Meulenhoff & Co., N.V., 2-4 Beulingstraat, Amsterdam, Holland • **Israel,** The Collective Subscription Agency, P.O. Box 768, Haifa • **Italy,** Intercontinental S.R.L., Via Edolo 27, Milan. Messaggerie Italiane S.p.A., Via Lomazzo 52, Milan • **Japan,** Maruzen Co. Ltd., 6 Tori-Nichome, Nihonbashi, Tokyo. Overseas Publications, Ltd., Central P.O. Box 1582, Tokyo • **Malaya,** City Book Store Ltd., Winchester House, Collyer Quay, Singapore • **Malta,** Allied Malta Newspapers, Ltd., Strickland House, 341 St. Paul Street, Valetta. Lewis Gauci, 71 St. Mary Street, Sliema • **Mauritius,** E. Dawood Ltd., P.O. Box 27, Port Louis • **Mexico,** The Crane Agency, Ave. 16 de Septiembre No. 6 Desp. 402, Mexico, D.F. • **New Zealand,** N. Hamilton Baker, G.P.O. Box 721, Wellington. R. Hill & Son, Ltd., Plaza Building, 236 Queen Street, Auckland C.1 • **Nigeria,** Goodwill Trading Co., Kemta-Okebode, Abeokuta • **Norway,** A/S Narvesens Kioskkompani, Stortingsgata 2, Oslo • **Pakistan,** Danishmand & Co., Karkhana Bazar, Lyallpur, W. Punjab. Seafar Agencies, opp. Grindlays Bank Ltd., Bunder Road, Karachi 2 • **Paraguay,** Representaciones Reuter, Calle Palma 308, Asuncion. • **Persia,** Vitab Commercial Establishment, 1856 Ave. Hafez, Tehran **Rhodesia & Nyasaland, Federation of,** V. W. Van Rijnberk, P.O. Box 238, Bulawayo, S. Rhodesia • **Salvador,** Antonio Garcia, 5a Calle Orient No. 75 San Salvador • **South Africa,** Technical Books (Pty.) Ltd., P.O. Box 2866, Cape Town • **Spain,** Distribuidora Internacional Soc. Ltda., Duque De Sexto, 36, Madrid • **Sweden,** Wennergren-Williams A/B, Box 657, Stockholm • **Switzerland,** Dr. H. R. Conrad, Rehmatt, Meilen, Nr. Zurich • **Syria,** F. H. Tcheleby, P.O. Box 225, Aleppo • **Turkey,** H. C. Hornstein, 1480 inci Sok. No. 12, Alsancak, Izmir • **U.S.A.,** British Publications Inc., 30 East 60th Street, New York 22 • American News Co. Inc., 131 Varick Street, New York 13. Moore-Cottrell Subscription Agency, North Cohocton, New York • **Uruguay,** Libreria Inglesa Ltda., Sarandi 530, Montevideo • **Venezuela,** Distribuidora Santiago C.A., Apartado 2589, Caracas.

NEWS of the WEEK

Activators	17
Note & Comment	19
People in the News	20
Plastics Laboratories	21
Diary Dates	22
Britain's First Atomic Power Station	23
From all Quarters	24
Development of Polyamides	25
Analytical Chemistry of Mercury - part 1	27
Stocks & Shares	32
Corrosion Prevention	33
Chemist's Bookshelf	34
Commercial Intelligence	38
Market Reports	40

BOUVERIE HOUSE · FLEET STREET · LONDON · EC4

Editor
GEOFFREY F. D. PRATT

Telephone : **FLEet Street 3212** *(26 lines)*
Telegrams : **Allangas · Fleet · London**

Director
N. B. LIVINGSTONE WALLACE

Manager
H. A. WILLMOTT

Midlands Office,
Daimler House,
Paradise Street,
Birmingham
(*Midland* 0784/5)

Scottish Office,
116 Hope Street,
Glasgow C2
(*Central* 3954/5)

Leeds Office,
Martins Bank Chambers,
Park Row,
Leeds
(*Leeds* 22601)

The annual subscription is 52s 6d ($7.40), single copies 1s 3d (by post 1s 6d). Overseas subscribers may send their subscriptions direct to London, or remit through any of our agents.

BRITISH TAR PRODUCTS LIMITED

MAKERS OF

PYRIDINE
PHENOL
CRESYLIC ACIDS

META-CRESOL
NAPHTHALENE
TOLUOLE · XYLOLE

ANTHRACENE OIL
SOLVENT NAPHTHA
ORTHO CRESOL

METHYL CYCLOHEXANOLS
CYCLOHEXANOL
CYCLOHEXANONE

SALES OFFICE

418A GLOSSOP ROAD · SHEFFIELD 10

Telephone : 60078-9 *Grams :* "Cresol, Sheffield 10"

ACTIBON

. . . the highly activated Carbon for ALL Decolourising purposes

THE CLYDESDALE CHEMICAL CO. LTD.

142 QUEEN STREET · GLASGOW C.1

Phone: CENtral 5247/8
Grams: "Cactus" Glasgow

VIEWPOINT

Activators

IN OUR ISSUE of 21 July, 1956 (p. 107) we published a note by Professor Nenitzescu *et al.*, of Bucharest, about the use of zinc and sodium alkyls as activators for titanium tetrachloride in the normal pressure polymerisation of ethylene. The main point made in the work was that the true polymerisation catalyst in the process first described by Professor Ziegler was an organo-titanium complex, and the aluminium alkyl was almost incidental, serving only as a source of alkyl radicals

Professor K. Ziegler in a recent note in *Angewandte Chemie* (**1**) has now pointed out that the Rumanian work is already anticipated to some extent by previous and current work by his own Institute. His comments are as follows:

'In the article "The Mulheim Normal Pressure Ethylene Process" which I published in this journal (**2**) together with E. Holzkamp, H. Breil and H. Martin not quite a year ago, after the paper had been read on 14 September in Munich, there appears on page 547 in paragraph 4 of the left-hand column, the sentence "the fact that titanium tetrachloride in particular can be transformed to polymerisation activating material with other types of reducing agents, without use of aluminium or other metal alkyls, was shown by Herr Breil in the course of his Diploma and Doctorate theses."

'On the same page, in paragraph 2 of the right-hand column, there appears, during a discussion on a British Patent of Du Pont, the sentence: "It is curious that this patent names all the heavy metals, such as Ti, Cr, V, whose compounds in combination with the same alkyl compounds of the alkaline metals, magnesium or zinc, give excellent catalysts for the process which we have discovered. It is only that the metals have been recommended for the wrong purpose, i.e. the activation of redox systems!" The sense of these sentences could hardly be misunderstood.

'It is clear from them that alkyl compounds of metals other than aluminium form with titanium tetrachloride (also of course with compounds of other heavy metals) polymerisation catalysts for ethylene. The use of zinc alkyls (and organic magnesium compounds) is described in my Belgian Patent No. 534,888 and that of alkali metal alkyls in my Belgian Patent No. 543,913.

'The state of our knowledge regarding metal alkyls in spring 1954 is summarised by Breil (**3**) in his diploma thesis in the following general rule:

"If one mixes organic compounds of the metals lithium, sodium (potassium, rubidium, caesium?), (beryllium?), magnesium (calcium, strontium, barium?), zinc (cadmium, mercury?), aluminium (gallium, indium?), with compounds of metals of the fourth, fifth and sixth sub-groups of the periodic system, then one obtains more or less highly active 'metallo organic mixed catalysts' for the polymerisation of ethylene."

'Set in brackets and marked with question marks are those metals upon the organic compounds of which no direct experiment had been made at that time (during 1954).

'My Institute must at present exercise restraint on the publication of its work in detail. However, anybody stimulated by our first publication to work in this field, can easily find himself in already anticipated territory. This has occurred in the case of the Rumanian workers (**4**).

'Finally it may be said that of course we have not left uninvestigated the problems of the nature of catalysts and the mechanism of formation of polythene. The black material which, in the limiting case, is ultimately formed from $TiCl_4$ and metal alkyls of the above type when there is suitable excess of the alkyl contains $Ti^{II}:Ti^{III}$ in proportion 1:1. The whole problem of the new catalysts is not, however, exhausted by this observation.'

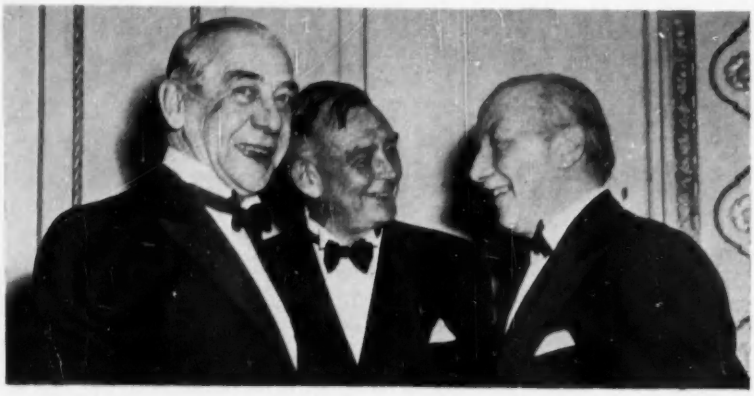
REFERENCES

(**1**) *Angew. Chem.*, 1956, **68**, 581.
(**2**) *Ibid.*, 1955, **67**, 541.
(**3**) Submitted in June 1954 at Bonn University.
(**4**) *Angew. Chem.*, 1956, **68**, 438.

OUR NEW SIZE

WITH this issue THE CHEMICAL AGE appears in large size, having been a pocket size publication since 4 July 1942. The publishers have devoted much thought to the design and layout of the new size and the paper now appears as an example of the best in contemporary typographical practice.

The spacious format and large type make for ease of reading, while diagrams and illustrations can now be reproduced in a size which will ensure clarity. The publishers believe that the new size will give added prestige to THE CHEMICAL AGE and that this will, in turn, reflect credit on the British chemical industry in the 64 countries where the paper circulates. Readers will notice that the change in size has involved a change in volume number. Thus, the issues for July, August and September will comprise Vol. LXXV, an index for which will be available in due course. This large size issue is the first of Vol. LXXVI.



EXPORT BRITISH 'KNOW HOW'

Diplomat's Advice on Selling to US

US BUSINESSMEN are interested in British industrial techniques and processes, declared Mr. I. Peter Garran, Minister (commercial) at HM Embassy in Washington, on 27 September. He was speaking to members of the Council of British Manufacturers of Petroleum Equipment and guests at the council's second annual dinner. He pointed out that Americans had a genius for adaption to suit their particular needs in matters of mass production and they were glad to import 'know how.'

Unfortunately many US firms did not know what Britain could do, said Mr. Garran. Our industry as a whole needed a long-term public relations campaign in North America. 'British experts ought to pay more visits to the US, speak at more conventions, and write more articles for the US trade and technical press about British industry, he remarked.

Export Policies

Progressive export policies did well in the US and our special skills could ensure a place for British goods in the US. But we had to be competitive, study market requirements and keep to delivery dates. After-sales service was also essential in maintaining goodwill. Mr. Garran warned his audience that German and Japanese exports to the US were developing rapidly, though our exports, which had steadily increased since the war, were 15 per cent above last year's total.

'Prospects for trading with the US are better than is generally realised,' said Mr. Garran. It was a steady market and the US Government wanted a liberal trade policy.

Chairman of the CBMPE, Mr. G. V. Sims, who presided at the dinner, spoke about the petroleum and chemical exhibition to be held in London in 1958. He said that some of the displays would open the eyes of the world and would reflect great credit on both industries. The CBMPE was making special arrangements to attract large numbers of overseas buyers to the exhibition.

Mr. Sims drew attention to the fact that this year orders to the value of £130 million had been placed by the petroleum industry, and this excluded tankers.

Over 700 attended the dinner.

Picture Above

At the annual dinner of the Council of British Manufacturers of Petroleum Equipment on 27 September. Left to right, Mr. Douglas Wilson (past-chairman CBMPE), Mr. G. V. Sims (chairman) and Mr. C. A. P. Southwell (Kuwait Oil Co. Ltd.)

Synthetic Rubber Imports

AN import programme of 80,000 tons of synthetic rubber in 1957 has been authorised by the Government. This compares with 70,000 tons this year. Of the total for 1957, 20,000 tons will be special purpose synthetic rubbers and 60,000 tons will be in the form of GR-S.

Although the United Kingdom is the world's largest exporter of rubber manufactures and the second largest consumer of rubber, numerous other countries consume proportionately more synthetic. Consumption of synthetic rubber in the United Kingdom is increasing, and the import programme for 1957 takes account of this.

Iraq Oil

TO provide crude oil for the Iraqi Government's bitumen refinery operating at Qayarah, the Mosul Petroleum Co. are to drill a second well there.

Johnson, Matthey

French Associate Company Formed in Paris

A NEW Johnson, Matthey associate company came into existence on 3 September when the inaugural general meeting of Etablissements Johnson, Matthey et Cie. SA took place in Paris. The issued capital is Fr.40,000,000, of which Johnson, Matthey & Co. Ltd. hold 81½ per cent.

The company has been formed to develop Johnson, Matthey sales in France. It has taken over the merchanting business of M. Pierre Motton, who has worked in close collaboration with the London company since 1917 when his family became agents for the sale in France of Johnson, Matthey products for the ceramic industry. The new company has also absorbed the business of Maurice Carrière et Cie., who acted as correspondents in France for the Bullion Department of Johnson, Matthey.

Mr. Basil McKenzie has been appointed Président du Conseil and Directeur Général of the French company. M. Maurice Carrieure is Directeur Général-Adjoint. The other directors are M. Pierre Motton, M. W. G. Frank and M. P. G. Smyrk.

Mr. Rodney Spence-Brown will shortly join the staff of the new company and Mlle. Marie José Motton, who spent some time with Johnson, Matthey in England a few years ago, will work in the Paris office from the commencement of trading activities on 1 October. Mlle. Denise Carriére has also joined the staff of Johnson, Matthey et Cie. SA at 76 Boulevard Haussmann.

Fraser Contract

A CONTRACT amounting to a little over £1 million has recently been placed with W. J. Fraser & Co., of Romford, Essex, for a complete fertiliser factory in New Zealand to produce 100,000 tons of superphosphate per year.

It is hoped that construction will be completed in just under two years to enable the spring demand for fertilisers to be met. The work will be carried out with the collaboration of Fraser's New Zealand agents, Cory-Wright & Salmon, of Wellington, and Downer & Co., also of Wellington.

The factory will incorporate a sulphuric acid plant and the raw materials will be imported sulphur and Nauru phosphate rock.

Frasers' are at present carrying out a similar contract in the North Island, New Zealand.

NOTE & COMMENT

TRADING PROFITS DOWN

VOLUME and value of ICI sales have increased in the first half of this year, but trading profits have fallen a little. The main reasons for this are that increased costs have not been matched by increased selling prices and there has been a fall in the holding price of certain non-ferrous metals. Unaudited figures published by the company on 27 September show that the consolidated turnover for the first six months of this year, and overseas subsidiaries for the first half of their current financial years ending in 1956 was £221 million (£206 million). Estimated net income, after depreciation but before taxation, was £20,325,000 (£20,855,000). Taxation estimated against this income is £9,915,000 (£8,880,000) and therefore the estimated net income of the company is £10,410,000 (£11,975,000).

ICI points out that its policy of stable prices, coupled with increased costs, will continue to have an effect on profit margins. There are, however, indications that the turnover for the second half of 1956 may somewhat exceed that for the second half of 1955. An interim dividend of 4 per cent (actual) on the ordinary stock has been declared.

CHEMICALS VERSUS MALARIA

AS IS NOW fairly well known, the pre-war story of anti-malarial measures was transformed by the advent of DDT. Pyrethrum-spraying of houses required twice-a-week frequency to bring sufficient control over the adult insect carriers. Oiling water surfaces, dusting with Paris green, and more mechanical control methods could be applied only to limited areas of the tropics. Rural malaria—mainly in villages set in the jungle—caused three million deaths a year and a far greater number of cases of severe ill-health. The persistence of DDT deposits changed this state of affairs in a very few years. Various controversies have centred around the use of DDT, but judged by its contribution towards malaria control alone DDT is one of this century's greatest contributions of science.

What is less well known is that gamma-BHC can give even superior control over malaria-carrying insects in common tropical conditions. In the early post-war period gamma-BHC's greater volatility seemed to give it less persistence than DDT—also, at that time the more concentrated and insecticidal gamma-isomeric form of BHC was not as easily available. In fact, it is now clear that gamma-BHC's volatility is an advantage when absorbent surfaces are sprayed. Both DDT and gamma-BHC are quickly adsorbed by mud; and mud is, of course, one of the major house-building materials of tropical areas. On mud surfaces gamma-BHC has a greater persistence for its volatility enables it to return to the surfaces. Smoke—commonly produced in native dwellings from wood fires used for cooking—has no masking effect as again gamma-BHC's volatility enables it to penetrate deposits of smoke on mud walls. Furthermore, the dosage rate required for a 50 per cent kill of a test species of adult vector in one hour—the median lethal dosage—is lower for gamma-BHC than for DDT or dieldrin, according to tests reported for WHO and recently described in *Nature* (J. R. Busvine, 1956, **177,** 533); DDT, 0.95 per cent; gamma-BHC, 0.015 per cent; dieldrin, 0.25 per cent.

This must not suggest that the pioneering DDT is already displaced. On non-absorbent surfaces such as woodwork that is painted, bamboo etc. its lower volatility gives it superior persistence. In such conditions gamma-BHC exerts inferior control.

RESISTANCE TO INSECTICIDES

REPORTS OF RESISTANCE of over 20 species of insects of importance to public health have now appeared. While this is certainly disturbing, the trouble is stated to be still localised for most of the insects concerned and many of them show, so far, only one type of resistance (*Brit. Med. J.*, 22 September). In Britain, for climatic reasons, there are fewer cases of resistance, and even immunity of houseflies to DDT and other chlorinated hydrocarbon insecticides has developed more slowly.

The housefly is, almost everywhere, resistant to DDT and its analogues and to gamma BHC, chlordane, dieldrin and like substances. Body lice and bed bugs are resistant to DDT in a number of places, though rarely in Europe, and at least four malaria-carrying mosquitos in US, Greece, Java, and Saudi Arabia. In N. Nigeria, where gamma BHC, chlordane etc. have been used, one anopheline malaria-carrier and several culicines are resistant.

The need to find suitable alternatives has drawn attention to the numerous organo-phosphorus insecticides, which are no more dangerous to man than the chlorinated compounds; these include malathion, diazinon, chlorthion, Diptenex and DDVP, (only the first is available in Great Britain). Unfortunately none of these has the long residual action of DDT or dieldrin.

Obviously, attempts must be made to control domestic and agricultural insect pests by different insecticides. Also, since resistance is due to a few individual insect pests proving resistant to one particular type of chemical, it is recommended that further investigations should be carried out using combinations of known insecticides, or likely insecticidal compounds. Also, there is a need for the development of further chemical compounds as insecticides.

People in the NEWS

● MR. JOHN DONALD MOIR DUNBAR, who is 65, retired from Scottish Agricultural Industries Ltd. on 28 September after 50 years' service to agriculture. Mr. Dunbar started with J. & J. Cunningham Ltd., Leith, one of the original SAI merger companies, in 1907. He joined the central office of SAI in Edinburgh in 1948. On his retirement he was deputy manager of the production and technical department. Mr. Dunbar is succeeded by MR. W. L. NICOL, at present works manager of the SAI fertiliser plant at Ayr.

● The Society of Leather Trades Chemists announces the election of the following officers for 1956-57: *President*, DR. L. GOLDMAN; *vice-president*, DR. R. G. MITTON; *members of council*: MR. E. F. WALLINGTON, DR. M. HORWOOD, MR. F. W. HANCOCK, MR. H. LEE, MR. J. S. MUDD, DR. T. WHITE; *hon. treasurer*, PROFESSOR D. BURTON; *hon. secretary*, MR. G. W. HUMPHREYS.

● Chief buyer of the British Oxygen Co. Ltd., since 1947, MR. CHARLES F. HUEBNER (52), has been elected chairman of the Purchasing Officers Association. He has been a member of the Association since 1932.

● MR. J. S. ROYE has been appointed sales manager of the chemical and agricultural division of Pfizer Ltd., Folkestone, manufacturers of Terramycin and other pharmaceuticals. He succeeds MR. RONALD PAGE, who has resigned to take over an appointment in the United States. Mr. Roye started his career with Silcocks (1931-32). He moved to Spillers in 1933 and was associated with that company until 1950. He joined Pfizer Ltd. in 1955 as an agricultural sales representative, and in this capacity pioneered the introduction of agricultural Terramycin in animal husbandry in East Anglia.

● Companionship of the Textile Institute has been conferred on JAMES EWING, SIR ERNEST F. GOODALE, H. G. GREG, SIR JOHN HANBURY-WILLIAMS, J. A. NASMITH, S. F. PESHALL and SIR E. RAYMOND STREAT.

● British Coal Utilisation Association's fifth coal science lecture will be given by PROFESSOR D. M. NEWITT on 17 October at the Institution of Civil Engineers, Great George Street, London SW1. Professor Newitt (Courtaulds Professor of Chemical Engineering, Imperial College of Science and Technology since 1945, and head of the department of chemical engineering and applied chemistry since 1952) will take as his subject 'Some Contributions of Chemical Engineering to the Processing of Coal'. He is a former president of the Institution of Chemical Engineers and his contributions to chemical engineering are well known, particularly those concerned with high pressure processes and fuel technology.

● MR. S. H. ELLIOTT, managing director, and MR. A. M. SHILLAM, works director, H. J. Elliott Ltd., laboratory glassware manufacturers, left London on 24 September for Germany where, at the invitation of a number of laboratory glassware manufacturers, they will carry out a programme of factory visits. Returning to Amsterdam, they will visit a leading research laboratory.

● R. Cruickshank Ltd., of Birmingham, announces the appointment of MR. L. W. H. EYERS, manager, London office, as staff director, London sales, and MR. J. R. BURSTON, manager, chemical division, as staff director, chemical division, West Bromwich.

● Remington Rand Ltd. announces the appointment of MR. LESLIE POYNDER as accounting machines sales executive (special assignments) with the Remington Rand International Division of the Sperry Rand Corporation. He will take up his new appointment in South Africa.

● New appointments in the research and development department of Food Machinery & Chemical Corporation's Westvaco Chlor-Alkali Division at South Charleston, West Va., have been announced by DR. C. H. BRAITHWAITE, laboratory section director. DR. P. F. DERR becomes process research supervisor in the laboratory section of the research and development department of FMC's Westvaco Chlor-Alkali Division. DR. RAYMOND ANNINO is named analytical supervisor in the laboratory section of the research and development department and MR. G. S. HAINES becomes technical staff assistant to the laboratory section director.

● The Messel Medal of the Society of Chemical Industry for 1956 has been awarded to SIR ALEXANDER FLECK, F.R.S., who will receive the medal and deliver his address under the title: 'The Chemical Industry: Some Achievements; Some Problems' at the Royal Institution, Albemarle Street, London W1, at 6.30 p.m. on Friday 12 October 1956.

● MR. H. S. PARRY, chief accountant of Monsanto Chemicals Ltd., is to become treasurer of the company on 1 November. MR. S. TURNER, at present deputy chief accountant, will become chief accountant.

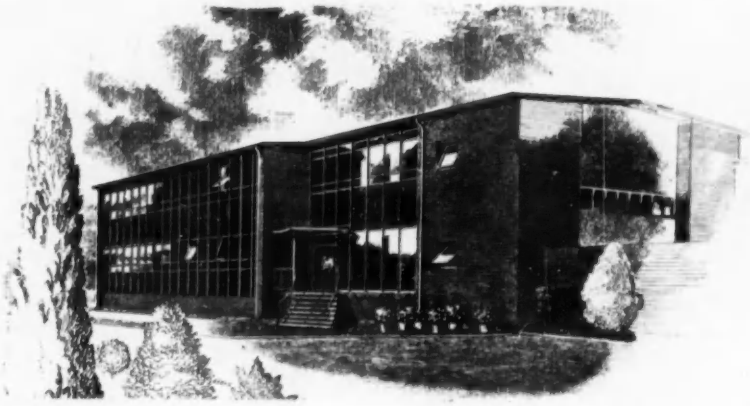
● Former public relations officer and publicity manager of Evans Medical Supplies, Liverpool, MR. W. JOHN MERRICK has been appointed joint managing director of Chadwick-Latz Ltd., the direct mail advertising agents of London.

● MR. PETER WICKENS has been appointed to the sales staff of Safety Products Ltd., manufacturers and suppliers of goggles, face shields and other personal protective equipment. He will look after the company's interests in the Midlands and the North of England. Mr. Wickens is a former editorial officer of the Industrial Safety Division of the Royal Society for the Prevention of Accidents.

OBITUARY

DR. CAMILLE EDOUARD DREYFUS, a pioneer of the rayon industry and founder, with his brother, of the Celanese group of companies, died in New York on Thursday 27 September. Dr. Dreyfus was born at Basle in 1878. He graduated at Basle University and the Sorbonne. After the first world war the brothers worked on the development of acetate rayon yarns and fabrics and chose the trade name Celanese for their products. Dr. Dreyfus developed the Celanese Corp. of America of which he was president for 27 years. He was also president of Canadian Celanese Ltd. and, after his brother's death in 1945, managing director of British Celanese Ltd.

MR. W. M. VALON (75), general manager of South Eastern Tar Distillers Ltd., and of an associate company, Johnson Bros. (Aylesford), Ltd., died on 20 September.



PLASTICS LABORATORIES

ICI Research & Development at Welwyn

ICI Plastics Division's £500,000 technical service and development laboratories were formally opened at Welwyn Garden City, Herts, on 28 September (see THE CHEMICAL AGE, 15 September, page 483). Designed to give technical service with existing products and to develop new materials, new applications and new processing techniques, the laboratories will supplement the work of the sales departments by providing technical background and experimental evidence to foster specific applications of plastics. The cost of the service is estimated to be under one per cent of the turnover.

Facilities on View

Most of the laboratory facilities were on view and a selection had been chosen for special demonstration when members of the technical press visited Welwyn on 27 September. The selection was not confined to new projects, but was intended to present a cross-section of present activities. In the moulding laboratory, for example, a Windsor Autoplas 1044 machine was being used to demonstrate the injection moulding of washing-up bowls, an example of the wide range of domestic wares produced from Alkathene by this process. The injection moulding machine is of the pre-plasticising type and is used for study of the behaviour of materials under production conditions in addition to investigation of new techniques.

Alkathene HD is one of the most recent additions to the ICI polythene family. Compared with the older forms of Alkathene, Alkathene HD has a higher density (0.94 gm/cc. against 0.92 gm/cc.), increased stiffness, greater tensile strength and improved heat resistance. Mouldings in Alkathene HD are considerably more rigid than articles of equivalent thickness in standard Alkathene and, as was demonstrated at the preview, can withstand sterilisation at temperatures up to 110° C.

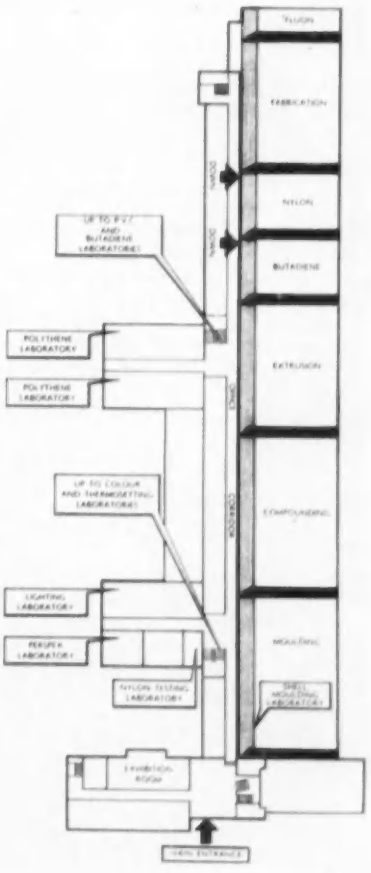
Two fields of fundamental investigational work on injection moulding were demonstrated. One featured a technique for following, measuring and recording the pressure developed in a mould cavity during a complete cycle of operations. This work is carried out on a Peco 40M injection moulding machine. The other demonstration, on a Peco 20M machine, showed the use of a spiral orifice mould for the determination of the flow of thermoplastics under a wide range of temperatures and pressures.

Extrusion Laboratory

In the extrusion laboratory, the effect of extrusion conditions on some of the properties of film made from Alkathene was shown by use of instruments such as a hazemeter, which gives an indication of surface structure; a transparency tester; and a Babinet compensator, which is used to measure the molecular orientation or strain in the film. Over 50 per cent of all Alkathene sold is processed on extruders. Although Alkathene presents less difficulty in extrusion than many other materials, careful control of extrusion conditions is necessary to obtain optimum quality of the extruded product. In developing polymers to suit the specific extrusion processes such as film, pipe, cable covering, and paper coating, a study of the factors controlling the quality of the product is made. Extrusion machines of various sizes are used and

[*Turn to next page*

Left, architect's impression of the entrance to the laboratories. Above, an experimental Alkathene being extruded to determine its processing qualities and the properties of the film made. A major aspect of the work of the department is that of developing new and improved materials and conversion techniques. Below, layout of the departments at the research and development laboratories



Anniversary Celebration

Progress in 10 Years

THE 10th anniversary of the formation of Fielden Electronics Ltd. is being celebrated during this month. The company was formed in October 1946 by Mr. John E. Fielden for the production of electronic industrial instruments. Mr. Fielden started with a handful of assistants on the top floor of a building in Holt Town, Ardwick. Two instruments were being produced; a drimeter and the auto control unit for the measurement of moisture content of textile material.

In 1950 the company moved to its present position at Wythenshawe, Manchester. At the present time it employs about 300 people. A diversity of instruments is now produced ranging from simple controllers to comprehensive automatic process supervisors.

Rubber Board's Film

A SOUND film, 'Rubber in Engineering,' was shown for the first time at the Natural Rubber Development Board's engineering conference on 27 September. It has been made by RHR Productions Ltd. and 16 mm. copies are now available on loan from Sound Services Ltd., 269 Kingston Road, London SW19.

Plastics Laboratories

From previous page]

a high degree of instrumentation is applied. Measurement of pressure, melt temperature, and cooling rate is made for instance in the extrusion of tubular film from Alkathene, a demonstration of which was given.

In the Fluon laboratory a screw extruder was seen producing tube from granular polymer. Equipment was also on view demonstrating the basic moulding and sintering techniques for this polymer. Fluon is a thermoplastic polymer remarkable for its virtual immunity to chemical attack, its low coefficient of friction, its non-stick surface, and its wide range of operating temperatures. It is the best of solid dielectrics, has a negligible water absorption, and is also non-inflammable. It is produced in both granular and dispersion forms.

Great importance is attached to the choice of pigments for each plastics material in order to provide maximum colour-fastness during processing and during subsequent service of mouldings. A major part of the work of the colour laboratory is concerned with pigment evaluation and weathering tests. Assistance is also given to ICI's manufacturing plants on colour matching problems.

DIARY DATES

MONDAY 8 OCTOBER

SCI (Plastics & Polymer Group)
London: 14 Belgrave Square SW1, 6.30 p.m. 'Production and Properties of Cellulose Triacetate' by E. B. Thomas and D. Finlayson.

The Chemical Society
Cambridge: University Chemical Laboratory, Lensfield Road, 8.30 p.m. 'Amine Oxidation' by H. B. Henbest.

Institute of Metals
Glasgow: Institution of Engineers & Shipbuilders in Scotland, 39 Elmbank Crescent C2, 6.30 p.m. 'Metallurgical Problems in the Heavy Organic Chemical Industry' by W. L. Wood.

Incorporated Plant Engineers
Dundee: Mathers Hotel, 7.30 p.m. 'Silicones' film and lecture by Midland Silicones Ltd.

TUESDAY 9 OCTOBER

The Chemical Society
Belfast: The Queen's University, 7.15 p.m. 'Chemistry and the Causeway' by E. M. Patterson. Joint meeting with RIC and SCI.

SCI (Agriculture Group)
London: Royal College of Science, 10.45 a.m. 'Polyphenols in Soils & Plants': 'Tannins, their Occurrence & Significance' by T. White; 'Aspects of the Significance of Polyphenols in Soil Organic Matter' by W. R. C. Handley; 'The Simpler Phenolic Substances of Plants' by A. H. Williams; 'The Significance of Polyphenols in Soil Formation' by C. Bloomfield.

SCI (Chemical Engineering Group)
London: 14 Belgrave Square SW1, 5.30 p.m. Film show.

Institute of Metals
Swansea: Department of Metallurgy, University College, Singleton Park, 6.45 p.m. 'Inventions of Bessemer in Relation to Non-Ferrous Metals' by H. O'Neill.

Hull Chemical & Engineering Society
Hull: Church Institute, 7.30 p.m. Joint meeting with Hull Section OCCA. 'Epoxide Resins, their Properties and Applications' by G. Swift.

WEDNESDAY 10 OCTOBER

Society for Analytical Chemistry
Newport, Mon: Technical College, 7 p.m. Joint meeting with SCI. 'Sequestering Agents and their Analytical Applications' by R. L. Smith.

Royal Institute of Chemistry
London: Isleworth Grammar School, Ridgeway Road, 7 p.m. 'The Scientific Examination of Paintings' by A. E. Werner.

SCI (Food Group)
London: 14 Belgrave Square SW1, 6.45 p.m. 'The Chromatographic Determination of Sugar and Oligosaccharides in Starch Hydrolysates' by D. M. Ireland; 'The Natural Ageing of Flour' by R. Bennett and J. B. M. Coppock.

Manchester Metallurgical Society
Manchester: Manchester Room, Central Library, 6.30 p.m. Presidential Address by G. A. Cottell.

Incorporated Plant Engineers
Nottingham: Sherwood Room, County Hotel, Theatre Square, 7 p.m. 'Germany and the Fuel Problem' by E. G. Phillips.

THURSDAY 11 OCTOBER

Royal Institute of Chemistry
Brighton: Brighton Technical College, 7 p.m. 'The Chemist in the Detection of Crime' by J. B. Firth.

Liverpool Metallurgical Society
Liverpool: Liverpool Engineering Society, 9 The Temple, Dale Street, 7 p.m. Presidential address by W. Rose.

FRIDAY 12 OCTOBER

The Chemical Society
Birmingham: Chemistry Department, The University, 4.30 p.m. 'Acetylene-Allene Chemistry' by E. R. H. Jones.

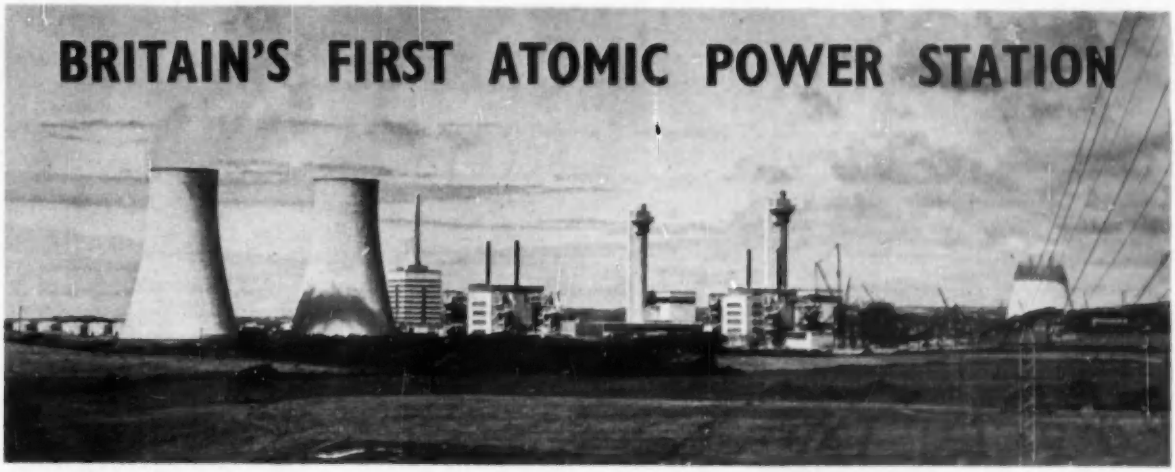
Royal Institute of Chemistry
London: Richmond and East Sheen Country Grammar School, Park Avenue, East Sheen SW14, 7.30 p.m. 'Careers in Chemistry'. Speakers: Norman Booth, Francis Aylward, T. McLachlan, Mamie Olliver.

Institute of Physics
Manchester: Bragg Building, The University, 6.45 p.m. 'Nuclear Magnetic Resonance' by E. G. Cox.

Oil & Colour Chemists' Association
Manchester: Engineers' Club, Albert Square, 6.30 p.m. Discussion: 'Paint Film Defects'. Short papers to be given by L. R. Rogers, A. C. Fletcher, F. Lewis and G. M. Geddes.

Plastics Institute (NW Division)
Urmston: Visit to Styrene Products, Partington Industrial Estates, 2.30 p.m.

BRITAIN'S FIRST ATOMIC POWER STATION



Calder Hall power station in Cumberland, which will be opened by HM the Queen on 17 October. Below, charging deck of No. 1 reactor 'A' station showing charging and discharging machines and control rod actuator mechanisms

INITIAL plans for the Calder Hall, Cumberland, atomic power station were made in the 1951-52 design study at Harwell for a gas cooled, natural uranium power reactor. By the spring of 1952 this study had reached the stage where Harwell was able to call in the British Electricity Authority (now the Central Electricity Authority), the Ministry of Works and a number of specialist firms.

A thermal reactor design office was opened at Risley, in Lancashire, in April 1953 and construction of the plant was begun in the August.

Uranium as Fuel

When investigations began on the construction of an atomic power plant the only fixed condition was that natural uranium should be the fuel. Important matters to be settled were the choice of moderator and coolant.

Possible moderators were beryllium (or beryllia), heavy water and graphite. Beryllium and beryllia were ruled out because neither was likely to be available in this country for some considerable time. Heavy water is expensive and the separation process was not operated in this country on a commercial scale.

On the other hand, graphite was available in quantity, its use was familiar and it was a reasonably efficient moderator. It suffers from the disadvantage that it is the least effective of the three materials and its use can result in a large reactor.

The nominal core diameter of the graphite structure is 31 ft. and the height of the core is 21 ft. The number of fuel element channels is 1696.

Questions of neutron economy largely determine the choice of coolant. Liquids generally are more efficient coolants, but they all react with graphite, necessitating lining of the coolant channels with metal tubes, and they all absorb neutrons.

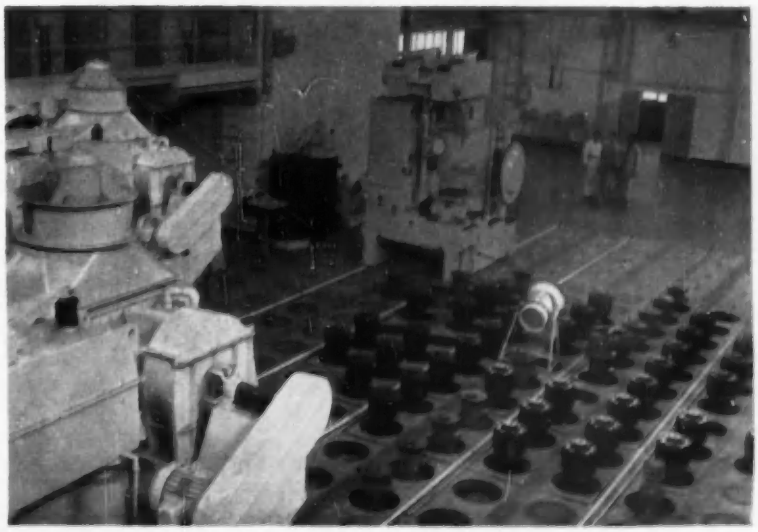
There are four gases possible as coolants, helium, hydrogen, nitrogen and carbon dioxide. Helium is the best but unfortunately it is expensive and not readily available in the United Kingdom. Hydrogen forms an explosive mixture with air and also reacts with uranium. Nitrogen absorbs neutrons very strongly and probably reacts with graphite in the presence of radiation.

Carbon dioxide is made in large quantities, it is cheap, it is a better heat transfer medium than helium, it is easier to pump and it does not absorb neutrons strongly. Its disadvantage is that it reacts with graphite to form carbon monoxide. Experiments, however, showed that even in the presence of radiation the rate of attack was well within the permitted tolerances.

The Carbon Dioxide Co., a division of The Distillers Co. Ltd., is responsible for the supply of carbon dioxide. The installation, the largest in this country, consists of four specially insulated steel tanks in which a total of 22 tons of liquid carbon dioxide can be stored. Each tank is fitted with an automatic pressure-controlled refrigerator which cools the liquid to about 0° F. and maintains the pressure at about 300 lb. per sq. in.

A variety of metals were tested for 'canning' the fuel elements. Two magnesium alloys containing beryllium were found after extensive experimental work to give the best results.

Main contractors for the plant were Taylor Woodrow who have formed a group with Babcock & Wilcox and English Electric for the construction of atomic power stations. The pressure vessels were constructed by Whessoe.



From all Quarters

South African Duty Rebate

ON 7 September the Union of South Africa *Government Gazette* published Government Notice No. 1657, which provides for rebate of customs duty to the extent of intermediate duty in respect of vinyl-acetate monomer, polyvinyl alcohol, tricresyl phosphate and dibutyl phthalate when imported for use in the manufacture of synthetic resins, synthetic resinous emulsions and synthetic resinous solutions. The issue of 14 September contains Government Notice No. 1664, amending paragraph 1 of part IV of the schedule to Government Notice No. 224 of 17 February (list of rebates of duty for manufacturing industries) as follows: (1) Substituting for sub-paragraph (8) the following: (8) Industry for the manufacture of laboratory apparatus and equipment: glass tubing.

Canadian Synthetic Rubber

UNLESS unforeseen developments arise shortly, Crown-owned Polymer Corporation of Canada will cease to use its allocation system of marketing rubber for the last quarter. Output is expected to reach a new record of 115,000 tons this year, i.e., 10 per cent over that of a year ago, also a record year. Polymer Corporation's exports are at a high level.

Finnish Chemical Wood Pulp

FINNISH chemical pulp industry production for 1955 is reported by Mr. T. Lassenius of the Finnish Cellulose Union (*Teknillisen Kemian Aikakanshehti*, 1956, 395). The industry reached a new production record of 1,825,793 tons, an increase of 250,000 tons or 16 per cent compared with the production record for 1954. The increase occurred equally in sulphite and sulphate pulp. Sulphate pulp exceeded the prewar production record of 260,000 tons, but the sulphite pulp production is still about 50,000 tons below the 1937 record. Marketing difficulties have affected the sulphite alcohol industry and the mills are stated to have been running at about one-third capacity. Sulphate byproducts, however, reached new production records: Raw turpentine, 5,320 tons, of which 4,985 tons were refined; raw tall oil, 18,679 tons, of which 6,283 tons were distilled; tall oil resin production was 1,458 tons and production of tall oil pitch 2,867 tons.

Indian Superphosphate Standard

AN AMENDMENT (No. 1) has been issued by the Indian Standards Institution to IS:294-1951—*Specification for Superphosphate (tentative)*. Because of difficulties which confronted the industry at that time, certain relaxations in the specification were allowed, especially with regard to the moisture content and free acidity. In the amendment, the limit for available phosphates based on citrate solubility has been included.

Columbian Oil Output

JULY oil production at 122,870 barrels, showed a slight drop on June's record figure but was still almost 7 per cent above last year's rate. Production of Foppetrol (the Columbian Government oil company) is falling slightly.

S. Rhodesia's Chrome Industry

LACK of adequate rail transport is handicapping Southern Rhodesia's chrome industry. With an annual turnover of £2 million it is the colony's fourth most lucrative industry and one of the Federation's steadiest dollar earners. Because of transport difficulties, however, development of the industry is negligible, and there is even a danger that many existing chrome producers will close down. No new mining ventures are being allocated any rail facilities. About 50,000 tons a month is being shipped out but double this amount could be produced. The producers have contracts and financial resources to increase present production. First grade chrome now fetches £15 15s a ton c.i.f. London.

Sulphur in Rup-Ganga Valley

IT IS reported that during the Rupkund expedition led by Prof. D. N. Majumdar, Mr. B. S. Tewari, Geology Department, Lucknow University, discovered a promising deposit of native sulphur at Piti Udiar in the valley of the Rup-Ganga, Bhamela Forest Plantation area, some 30 miles east of Nandprayag. The mineral is stated to be powdery in nature, but occasionally stalactitic. Extractable sulphur content varies from about 58 to 60.7 per cent. It is considered that the deposit, may yield sulphur of high purity.

Bolivian Oil Industry

TWO new oil wells of the State Oil Industry (YPFB) in the Bermego area were brought into operation in June. The Bolivian Government has now authorised the YPFB to purchase 300 km. of piping from Brazil for the construction of a pipeline from Camine to Santa Cruz. One and a quarter million dollars have been allocated for this purpose within the Bolivian-Brazilian trade agreement.

Bombay Imports

TOTAL VALUE of foreign trade of Bombay for June 1956 amounted to Rs47.13 crores, an increase of 4.72 crores over that of June 1955. Imports accounting for the increase include chemicals and chemical preparations, valued at 127.60 lakhs of rupees (plus 35.59 lakhs on June 1955 figure), dyeing and tanning substances—aniline dyes, 115.64 lakhs (plus 20.25 lakhs on June 1955 figure), drugs and medicines, 115.05 lakhs (plus 31.38 lakhs compared with June 1955), and instruments and apparatus, etc., 165.37 lakhs (61.09 lakhs over June 1955 figure).

by
E. G. Curphey

Development of Polyamides

NYLON'S WIDE APPLICATIONS

POLYAMIDES, particularly as fibre-forming polymers, assumed importance in this country towards the end of World War II. Linear polyamides had of course been developed by the Germans, who used 6-aminocaproic acid and 7-aminoheptoic acid as the reacting monomers. Polymeric polyamides, such as polypeptides, were of course known as far back as 1908 when Leuchs, using N-carboxy anhydrides, prepared the corresponding polypeptides by what is known today as an ionic polymerisation process. Before Leuchs' experiments however, Emil Fischer had synthesised polypeptides using chloracetyl amino acetic acid derivatives, obtaining polymers of low molecular weights. Due possibly to their low molecular weights, their application to the production of fibres was not appreciated at the time.

Du Pont's Patent

In 1937 the Du Pont patent appeared, describing a process for the production of fibre-forming polyamides, in which the polycondensation was carried out in an atmosphere of nitrogen; water and solvent being removed by distillation, the latter expedient facilitating the production of long chain polymers. Variations in aqueous vapour pressures in such polycondensation systems were shown to influence the extent of the amino and carboxyl end groups. The resulting fibres possessed typical X-ray diffraction patterns. The techniques involved alkaline oxides, carbonates and polyvalent halides as catalysts.

Since those days considerable research has been directed to the production of superior fibres and plastics materials and today we have photochemical resistant fibres as well as wool-like nylon yarns. The manufacture of such improved fibres has involved the use of auxiliaries in the polymer recipe, which may be added either during or after the polymerisation stage. By such means desirable characteristics are imparted to the fibres.

Dyeing Properties Improved

Heavy fire resistant fibres have been obtained from polyamides having fluorine substituted in the molecule, while on the other hand, the introduction of basic moieties in the molecule tends to improve the dyeing properties of the polymer. Rubber-like products have been obtained as a result of the condensation of bifunctional acids with the dialkylol tertiary amines. An increase in the number of interchain links tends to afford thermosetting polyamides. This may be brought about by the presence of suitable polar groups in the molecule.

Colourless rubbery solids have been obtained by the heating of N,N'-bis-ethylol hexamethylene diammonium adipate for three hours in nitrogen at 200°C. Linear polyamides having low permanent set or residual elongation, of use in the manufacture of tyres, have been suggested from the polyamides prepared from aliphatic diamines and bis-1,4-phenyl propionic acid as the reacting monomers.

Eliminating Defects

The incorporation of manganese and copper lactates, in amounts of the order of 0.03 to 0.008 by weight of polyamide, in polymer trials, eliminates the objectionable defects brought about by photochemical changes; such changes may also be obviated by the addition of a chromium salt such as chromium fluoride to the reacting monomers, the polymerisation then being effected in the presence of the salt. A standard procedure involves the use of suspensions of titanium dioxide in aqueous chromium fluoride, the mixture being then added to the aqueous caprolactam. The polymerisation is then effected at 250°C.

The production of wool-crimps in nylon fibre is obtained by first of all soaking the orientated fibre in a one per cent solution of ammonium chloride, the fibre being then dried and treated with anhydrous HCHO vapour for a quarter of an hour at 150°C. The final phase of the operation involves drying and washing and the passing of the treated fibres over a heated metal bar. The accrued crimping effect may be due to some disorientation in the fibre coupled with a cross linking effect imposed on the fibre by the formaldehyde.

Imparts Fire Resistance

The effects of modifications in the chemical structure of a polymer on its ultimate properties may be exemplified in the fluorinated polyamides. The introduction of fluorine in the molecule imparts *inter alia* fire resistance, as well as producing heavy fabrics having a silk-like finish. Such polymers are obtained by reacting diethyl octofluoroadipate and hexamethylene diamine as monomers.

The structure of a polyamide can again influence to some extent the ironing temperatures of the resulting textile. Thus structures permitting maximum inter-chain bonding and crystallite formation, impart a positive influence on such temperatures. This would imply that the greater the length of the polymethylene chain, the less the crystallising tendency, and the lower the resulting fusion temperatures.

The low fusion temperatures of the caprolactams as compared with the 66 nylons is stated to be due to the statistical improbability that contiguous polymer

Development of Polyamides

chains will arrange themselves in opposite directions to permit maximum – NH and CO – inter bonding.

The introduction of hetero atoms into the polyamides has been claimed to protect the polymer against the deleterious action of light. Polymers having high melting points by virtue of their pronounced crystalline structures have been obtained using bifunctional acids such as diphenoxy alkane -4:4'- dicarboxylic acids.

In the production of such polymers, phenol has been used as solvent and phosphoric acid as catalyst. Yarns prepared from fibres produced from hexamethylene diamine and a diphenoxybutane diacid having the following physical properties (a) tenacity 2.8 g. per denier, (b) initial modulus of 58.3 g. per denier and (c) elongation at break of 15.5 per cent, showed on exposure to light a fall in tenacity of 0.1 g. per denier.

Good Ironing Temperatures

The introduction of appropriate arylamino acids in the polyamide structure affords fibres with good ironing temperatures. Thus *p*-aminobenzoic acid has been copolymerised with hexamethylene diammonium adipate. Other aryl acids such as the aryl oxy acids have been incorporated into polyamides. Thus *o*-hydroxyphenoxy acetic acid when included in polyamides, serves to protect fibres from weathering and the action of light.

Nylon fibres are preferably produced by a melt spinning process, owing to the limited number of solvents capable of bringing the polymer into solution. The known solvents such as phenol and formic acid have undesirable properties. In dyeing operations the temperature of the melt is of importance since the occurrence of too high temperatures might lead to disproportionations and ultimate discolorations.

The solvents for nylon, by virtue of their solvating characteristics, are useful auxiliaries in dyeing operations. The lower molecular weight fatty acids and their derivatives have proved useful in such operations. Taffeta fabrics prepared from the caprolactams have been successfully dyed using direct dyestuffs such as Fast Red BLL, the fibre being initially treated with a solution containing hydrogen peroxide and acetic acid (20 per cent) at 80° C for a short time (20 seconds).

Deep Red Shade

The neutralised and washed fabric gives a deep red shade, which without the acid technique would have only yielded a pale coloration. In the same way nylon cretonne fabrics have been dyed using lactic acid at temperatures around 95° C for 30 seconds, the fabric being then dyed with Naphthol Dyestuff AS-ITR.

Although nylon is dyed by those dyes suitable for wool and silk, by virtue of the reduced number of basic groups in the linear chain as compared with those extant in the natural polymers, the dye susceptibility of the nylons appears less than that observed for wool and silk. The introduction of benzimidazole moieties in the polymer chain has served to offset this difference. To attain this aim, ε-caprolactam has been polymerised with 2-(ω-aminopentyl benzimidazole-5-carboxylic acid). The good thermal and chemical stability of the resulting copolymers have accorded them preference over the obsolete techniques using tertiary amino groups.

To minimise the tendency of nylon sewing threads to pucker, stretched fibres have been treated with a solution of a linear polyamide in an aliphatic alcohol (b.pt.<200° C) and a fatty acid and formaldehyde.

The wider applications of the polyamides are seen in engineering, in which silent bearings, rollers and gears have been produced from nylon. High melting polymers are used for this purpose, the recipes containing small amounts of molybdenum sulphide (0.25 to 5 per cent), fillers and oxidising agents. Thixotropic paints depend upon the secondary valencies extant in the polyamide molecules. In the production of pipes for dairies and breweries, the caprolactam polyamides have found application.

UNICAM'S MAGAZINE

Aid to Users of Instruments

THE DIFFICULTIES of keeping in touch with users of its instruments all over the world have prompted Unicam Instruments Ltd. to publish a news magazine, *Spectrovision*. The first issue has now appeared and further issues will appear quarterly or more frequently if necessary. As an example of the type of material to appear in *Spectrovision*, the first number contains an article entitled 'Uricase Leo in the Determination of Uric Acid.' Uricase Leo is a highly purified, lyophilised and stable enzyme produced by Leo Pharmaceutical Products and marketed in this country by A. Revai & Co. (Chemicals) Ltd., 7-8, Idol Lane, Eastcheap, London EC4. Estimation of uric acid is important in checking uricosuric drugs, in diagnostic work and in research work on compounds such as corticotropin (ACTH) and phenylbutazone. The method is based on the fact that uric acid absorbs strongly in the ultra-violet with the characteristic absorption band centred between 290 and 295 mμ. The absorption disappears completely after the addition of Uricase Leo and the concentration of uric acid in a solution is therefore directly proportional to the difference in the extinction before and after addition of the Uricase. It is claimed that up to 10 samples can be examined in an hour using the SP 500 ultra-violet spectrophotometer. A regular feature of this magazine will be a bibliography dealing with an item of current interest to the practising spectroscopist. The subject in this issue is the determination of iron. A mailing list is being compiled and people interested in receiving copies are invited to write to Unicam Instruments Ltd., Arbury Works, Cambridge.

New Catalogue

THE recently produced publication No. 62 of W. C. Holmes & Co. Ltd. pictorially surveys the range of products manufactured by that organisation. Intended merely to give an indication of the range of the company's activities, the brochure illustrates some of the products of the gas and chemical engineering division, gas handling division, and gas cleaning division.

Analytical Chemistry of Mercury

At a meeting of the Midlands Section of the Society for Analytical Chemistry at Nottingham, on 27 March, the subject for discussion was 'The Analytical Chemistry of Mercury'. The two principal speakers were to have been Mr. G. J. W. Ferrey (James Woolley Sons & Co. Ltd., Manchester) and Dr. R. F. Milton (Analytical & Consulting Biochemist, London), but neither was able to be present. Mr. Ferrey's paper was read by Dr. D. C. Garratt (Boots Pure Drug Co. Ltd., Nottingham) and Mr. W. Duffield deputised for his colleague Dr. Milton. In his paper, aspects of the analytical chemistry of mercury were discussed by Mr. Ferrey with special reference to pharmaceutical applications.

MERCURY and its simple inorganic compounds were used medicinally as early as the 16th century. In modern medicine, the use of inorganic mercury was tending to decline and that of complex organic mercurials to increase. The element was used in pharmacy as the metal and the oxides, and as simple salts, e.g. chlorides, iodides, nitrates, cyanide and oxycyanide. Its organic compounds included:

(1) Simple salts of organic acids, from which a large number of mercurials used in medicine were derived, e.g. mercurochrome, phenyl mercuric acetate, and mersalyl (Figs. 1, 2 & 3).

(2) Derivatives of compounds in which mercury was attached to two organic radicals, e.g. phenyl mercuric nitrate (derived from diphenyl mercury) (Fig. 4).

(3) Compounds in which mercury was attached to nitrogen and sulphur, e.g. mercury succinimide and thiomersal (Figs. 5 & 6).

The medicinal and pharmaceutical uses of mercury could be classified as (i) antibacterial or antiseptic, (ii) antisyphilitic, (iii) diuretic, and (iv) cathartic or purgative.

Antibacterials killed bacteria or inhibited their growth. Probably the best-known, though by no means the best for this purpose, was mercuric chloride sublimate. It was too irritant for use on raw surfaces except in very dilute solution, and had a corrosive action on metals which prevented its use for sterilising metallic instruments and utensils. Mercury oxycyanide, being only very slightly ionised, was much less irritating to tissues and did not corrode metals. Many organic mercurials, e.g. mercurochrome, phenyl mercuric nitrate and thiomersal, were used for their antibacterial action.

Mercury, both as metal and in the form of its salts, had long been used in the treatment of syphilis. It was used mainly in the form of ointments and parenteral injections. It had now largely been replaced by arsenicals, and even its use as an adjunct in the treatment of syphilis by arsenic had been replaced by bismuth.

Action of Diuretics

Diuretics were drugs which stimulated the action of the kidneys and increased the flow of urine. They were of great service in dropsical conditions. Calomel was formerly largely used for its diuretic properties, but it had uncertain action and undesirable side effects. The marked diuretic effect of the complex organic mercurial, novasurol, was accidentally discovered when this drug was first introduced as an antisyphilitic, for which purpose it was found to be ineffective. The standard mercurial diuretic was now mersalyl, which was administered by intramuscular or intravenous injection.

Calomel and mercury metal itself, in a finely divided

Fig. 1. Mercurochrome

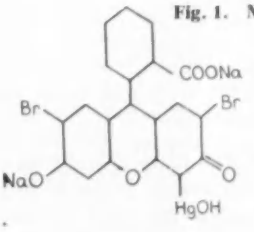


Fig. 2. Phenyl Mercuric Acetate

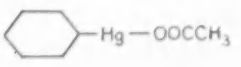


Fig. 3. Mersalyl

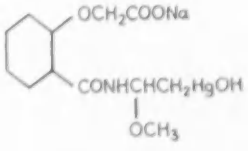


Fig. 4. Phenyl Mercuric Nitrate

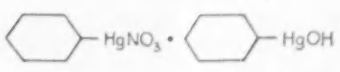


Fig. 5. Mercury Succinimide

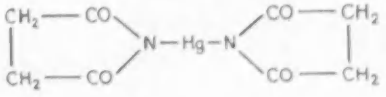
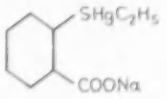


Fig. 6. Thiomersal



form, for example, in pill of mercury and in mercury with chalk, were used as cathartics. They could be given in tablet form or diluted with milk sugar. Mercury with chalk and calomel were mild in their action and were, until recently, administered to infants in teething powders, but had now fallen into disuse for this purpose because they were suspected of being concerned in certain cases in the onset of 'Pink Disease'.

In general, water-soluble compounds of mercury were only used externally. Internally, calomel, mercury metal itself and some of the complex organic mercurials were used. The action of difficultly-soluble compounds was supposed to be due to the formation of minute amounts of mercuric ions, which exercised their irritant effect on tissues in a strictly limited form.

Pharmaceutical Analysts' Concern

The pharmaceutical analyst was therefore concerned with determining the strength and purity of mercury salts and compounds and with the assay of simple solutions, tablets, pills, drops, injections, powders, dusting powders, surgical dressings and, the largest group, ointments. Normally, macro-scale gravimetric or volumetric methods were used. In some modern preparations, very small amounts of mercury were present and colorimetric assays were more convenient.

Some of the physical and chemical properties of mercury were of primary importance to the analyst. Mercury was the only metal liquid at ordinary temperatures. It froze at −38.9°C and boiled at 357°C at normal pressure. It had an appreciable vapour pressure, which increased rapidly with increase of temperature (see Table I), and therefore precautions had to be taken against loss in analytical processes involving elevated temperatures.

TABLE I

Vapour Pressure of Mercury (Friend)

Temp. (°C)	..	16	50	121.8	150	191.5
VP (mm Hg)	..	0.0010	0.00113	0.829	2.802	13.02

Mercurous & Mercuric Salts

It formed two well-defined series of salts, mercurous and mercuric. Mercuric halides and thiocyanate were only very slightly dissociated. Mercuric salts of strong inorganic oxy-acids and also of weak acids were readily hydrolysed and formed insoluble basic salts. Mercuric salts tended strongly to form complex salts with mercury in the anion. Mercurous salts had little tendency to complex formation and many were only slightly soluble in water. They were readily converted to the mercuric state by oxidation with halogens or other oxidising agents.

Mercuric chloride volatilised appreciably when its aqueous solutions were boiled or evaporated; this tendency was lessened by the addition of hydrochloric acid or alkali chloride, with which mercuric chloride formed stable complexes. Mercuric bromide showed much less tendency to volatilise under similar circumstances, especially in the presence of hydrobromic acid. Mundy and Rix (**1**) showed that volatilisation of mercuric chloride from aqueous solution during evaporation was prevented by the addition of seven per cent potassium iodide.

ANALYTICAL CHEMISTRY

TABLE II

Evaporation of 150 ml. of 0.25 per cent mercuric chloride solution

Expt.	% KI added	% $HgCl_2$ recovered
1	Nil	42.0
2	Nil	42.8
3	Nil	40.0
4	2.286	88.0
5	2.286	94.8
6	2.286	88.8
7	4.571	91.2
8	7.0	98.4
9	7.0	99.2
10	7.0	99.6

Compounds of mercury were readily reduced to the metallic state. When heated in a closed tube with anhydrous sodium carbonate, they yielded a grey sublimate of metallic mercury. Mercury was low in the electromotive series (normal potential +0.80 volt) and was reduced to the metallic state from solutions of its salts by many metals. Of interest in pharmaceutical analysis were zinc (normal potential −0.76 volt), aluminium (**2**) (normal potential −1.3 volt) and copper (normal potential +0.34 volt). Many other agents reduced mercury to the metallic state, e.g. hydrazine (**3**), formaldehyde (**4**), glycerol (**5**), the three ethanolamines (**6, 7, 8**), stannous chloride (**9**), and hypophosphorous acid (**10, 11**).

Amalgams with Other Metals

Mercury readily formed amalgams with other metals and this property was used in analytical work, e.g. in the Reinsch test with copper, and in the isolation of mercury from many pharmaceutical combinations by amalgamation with zinc. Finally, reference was made to the solubility of mercuric halides in organic solvents, which was sometimes useful in isolating mercury from aqueous solutions.

The following dry assays could be carried out. The old method of ignition with lime was carried out in a long tube of combustion glass, the mercury vapour being carried along by a stream of carbon dioxide or coal gas and condensed at the far end (**12**). Ores of mercury were assayed by mixing with iron filings and igniting in a deep crucible with a tared snug-fitting lid of gold or silver kept cool by a fitting cylindrical water-cooled condenser. The mercury was volatilised as metal, it amalgamated with the lid and was weighed (Escha-Holloway Method (**13**)). A similar process was used in the AOAC Official Methods of Analysis for the assay of organic mercurial seed disinfectants (**14**).

Dry assays found little application in pharmaceutical work, the main emphasis being on a volumetric finish, usually by titration with standard thiocyanate, which, however, could not be used in the presence of halides. For this titration, mercury was normally brought into solution in dilute nitric acid and had to be in the mercuric state. Mercurous nitrate on titration with thiocyanate yielded some mercuric thiocyanate and metallic mercury, the solution becoming grey:

$$2HgNO_3 + 2KCNS \rightarrow 2HgCNS + 2KNO_3$$

$$2HgCNS \rightarrow Hg + Hg(CNS)_2$$

Therefore, unless all the mercury was mercuric, low results were obtained. Because mercuric thiocyanate

OF MERCURY

was ionised to a slight extent, the end point with ferric nitrate tended to appear too soon, and this was emphasised by high acid concentrations and high temperatures (**15**). Rupp (**16**) observed that at low temperatures the acid concentration was less important than at high. Kolthoff (**17**) confirmed this and recommended a temperature of not greater than 15°C. At this temperature, pure mercury and pure silver gave identical titres in the standardisation of thiocyanate (**18**).

At higher temperatures, thiocyanate for mercury assays should be standardised against pure mercury under identical conditions. Nitrous acid must be absent; this was usually effected by gentle boiling or the addition of permanganate, or both. Urea or sulphamic acid could be added to react with nitrous acid. A fairly large amount of ferric indicator should be used, otherwise the end point was obscured (**15**). Cumming and Spice (**19**) recommended acid concentrations of from 0.7N to 2.5N.

Mercuric Halides

Mercuric halides did not react quantitatively with thiocyanate because of their slight dissociation. Bromide interfered more strongly than chloride. Silver obviously must be absent. According to Kolthoff and Stenger, it was necessary to add sufficient sodium chloride to convert all the mercury into the complex ion $HgCl_4^{--}$ before the silver chloride was precipitated (**20**). This fact was of importance in the pharmaceutical limit test for chloride in mercuric oxide and mercury oxycyanide, and explained why the mercury was removed by amalgamation with zinc before the limit test was applied. If the mercury was not so removed, a considerable amount of chloride could be present before a precipitate was formed on adding silver nitrate (**21, 22**).

TABLE III

Precipitation of silver chloride in mercuric nitrate solution

Mercuric oxide	Nitric acid	Silver nitrate 2 ml. of	Total volume	0.5N HCl to give ppt.	Chloride as Cl	Chloride as % sample
1.0 g.	5 ml. (1:2)	0.1N	60 ml.	2.95 ml.	52 mg.	5.2
1.0 g.	5 ml. (1:2)	0.3N	60 ml.	0.65 ml.	12 mg.	1.2
1.0 g.	5 ml. conc.	0.1N	60 ml.	3.0 ml.	53 mg.	5.3

There were several methods available which depended on the formation of complex ions. Mercuric mercury formed complex ions in solution, particularly with halide, cyanide, thiosulphate and thiocyanate salts. The complex ion HgI_4^{--} formed on the addition of an excess of potassium iodide, was very stable and formed the basis of several assays. The complex was formed with mercuric oxide, an equivalent amount of alkali being liberated:

$$HgO + 4KI + H_2O \rightarrow K_2HgI_4 + 2KOH$$

Incze (**23**) recommended the process for the standardisation of volumetric solutions of acids, but his conclusions were not wholly confirmed by Kolthoff and van Berk (**24**), who experienced difficulty in preparing mercuric oxide of sufficient purity. Potassium bromide could replace the more expensive iodide; the complex was not as stable, but this was of no practical disadvantage. There was also less interference from atmospheric carbon dioxide. Mercuric cyanide (**25**) was assayed in the same way; hydrocyanic acid did not, of course, interfere with the titration of the liberated alkali:

$$Hg(CN)_2 + 4KI + 2H_2O \rightarrow K_2HgI_4 + 2KOH + 2HCN$$

Thiosulphate could be used instead of iodide, the thiosulphate complex being quite stable (**26**):

$$Hg(CN)_2 + 2Na_2S_2O_3 + 2H_2O \rightarrow Na_2Hg(S_2O_3)_2 + 2NaOH + 2HCN$$

True Basic Salt

Mercury oxycyanide of the British Pharmacopoeia (BP) did not correspond to the true basic salt, $Hg(CN)_2.HgO$, which was explosive, but was a mixture of oxycyanides containing the equivalent of 14.5 to 16.5 per cent HgO and 83.5 to 85.5 per cent $Hg(CN)_2$. It was assayed by Tagliavini's process (**27, 28, 29**) whereby alkali was liberated from the HgO moiety only by the addition of sodium chloride, the $Hg(CN)_2$ complex being unaffected:

$$HgO\,.\,Hg(CN)_2 + 4NaCl + H_2O \rightarrow Na_2HgCl_4 + 2NaOH + Hg(CN)_2$$

After neutralisation, potassium iodide was added and the alkali liberated from the cyanide moiety titrated:

$$Hg(CN)_2 + 4KI + 2H_2O \rightarrow K_2HgI_4 + 2KOH + 2HCN$$

The method was capable of considerable accuracy in very dilute solution and was used in the British Pharmaceutical Codex (BPC) to determine the mercury content of eye lotion of mercuric oxycyanide, which contained only 0.022 to 0.025 per cent mercury. The assay of ammoniated mercury, NH_2HgCl, was entirely analogous (**30**), the salt being dissolved in potassium iodide solution in a stoppered flask, and the liberated potassium hydroxide and ammonia titrated:—

$$NH_2HgCl + 4KI + H_2O \rightarrow K_2HgI_4 + KCl + NH_3 + KOH$$

Thiosulphate could be used instead of iodide and the mercury compound then dissolved very rapidly. It could also be assayed by adding a slight excess of potassium cyanide:

$$NH_2HgCl + 2KCN + H_2O \rightarrow Hg(CN)_2 + NH_3 + KCl + KOH$$

and neutralising to methyl orange. The mercury was then bound as cyanide, and could be titrated by adding an excess of iodide or thiosulphate to liberate an equivalent amount of alkali (**31**). Mercuric cyanide was so slightly dissociated that when a solution of hydrocyanic acid was added in excess to a solution of mercuric chloride, mercuric cyanide was formed and an equivalent of hydrochloric acid liberated (**32**):

$$HgCl_2 + 2HCN \rightarrow Hg(CN)_2 + 2HCl$$

Hydrocyanic Acid Solution

A solution of hydrocyanic acid was conveniently prepared for this purpose by titrating a potassium cyanide solution with standard acid, using methyl orange as indicator. A variant (**33**) of the method made use of the fact that potassium cyanide reacted alkaline due to hydrolysis. To the neutral solution of mercuric salt phenolphthalein was added and then standard potassum cyanide solution (free from alkali hydroxide or carbonate) until a pink colour appeared:

$$HgCl_2 + 2KCN \rightarrow Hg(CN)_2 + 2KCl$$

$$2K^+CN^- + H_2O \rightarrow 2K^+OH^- + 2HCN$$

Several volumetric methods involved a reduction to the metal. Rupp (**4**) had worked out a method over

which there had been much controversy, but which was used, nevertheless, for the assay of mercuric chloride in the BP. In the presence of potassium iodide, mercuric salts were reduced to the metal by alkaline formaldehyde:

$$HgCl_2 + 4KI \rightarrow K_2HgI_4 + 2KCl$$
$$K_2HgI_4 + 3NaOH + HCHO \rightarrow$$
$$Hg + HCOONa + 2NaI + 2KI + 2H_2O$$

The solution was then acidified and the finely divided mercury dissolved in standard iodine solution. To complete the reduction it was essential to have at least three per cent alkali hydroxide present, but the main source of error in the original method was undoubtedly the tendency of the metal to coalesce rapidly into globules too large to be attacked readily by iodine (**34, 35, 36**). Several devices had been suggested to obviate this. Fitzgibbon (**37**) added gelatine to the solution, Stüwe (**38**) used mucilage of acacia. Brindle (**36**) stated that such additions led to low and erratic results, and suggested the addition of a mixture of ether and chloroform to modify the interfacial tension between the mercury globules and the aqueous solution.

Metal Finely Divided

Later, Brindle and Waterhouse (**39**) added calcium chloride to the mercury solution before adding alkali, thus keeping the metal finely divided on a support of calcium hydroxide. They then attempted to avoid all the errors of the Rupp method by heating to encourage the coalescence of the metal, which they filtered off through a No. 4 sinter and dissolved in nitric acid for a thiocyanate finish.

There was a risk of loss by volatilisation, by drawing metal through the sinter and by spray on dissolving the metal in nitric acid. Sloviter, McNabb and Wagner (**3**) used a similar filtration method, precipitating the metal on a substrate of basic magnesium carbonate as a filter aid. For control of preparations where a fair tolerance was permitted, the Rupp method was rapid and useful. Notwithstanding the opinion of Brindle, Mr. Ferrey had found the use of acacia just as reliable as calcium chloride, but he did not regard the method as sufficiently precise for the assay of pure salts.

Reducing Agent

The reducing agent which had found most favour in pharmaceutical analysis was zinc, either as powder, filings or granules. It had the added advantage of collecting the mercury by amalgamation, and was used in acid or alkaline solution with or without the use of a supplementary reducing agent such as formaldehyde. Sage and Stevens (**40**) determined the mercury content of biniodide tablets by boiling them under reflux with zinc filings and 50 per cent acetic acid.

Zinc powder was used by Heading (**41**) for the assay of strong ointment of mercuric nitrate (BP 1932), which was prepared by a very unsatisfactory process and contained free mercury, mercuric and mercurous nitrates, mercury soaps, fats altered by the action of nitric acid and unchanged oil and fat. Heading's method of assay was to boil the ointment in an open beaker with strong aqueous potash in the presence of zinc dust. Hampshire and Page (**42**) found the method gave low results, and Mr. Ferrey was able to show in 1938 that this was due to volatilisation of metallic mercury during boiling (**43**). When the process was carried out under reflux, very satisfactory recoveries were obtained.

ANALYTICAL CHEMISTRY

The method was extended the following year to the assay of dilute ointment of mercuric nitrate which had hitherto defied accurate analysis on account of its very large content of paraffins (**44**). Use was made of the fact that ethyleneglycol monoethyl ether dissolved substantial amounts of paraffins at its boiling point (**45**). The ointment was refluxed with zinc dust and a solution of potash in this solvent, and good recoveries obtained.

Method of Preparation

In the present BP, the method of preparation of the strong ointment had been entirely changed and these methods of assay were no longer applied to either the strong or the dilute ointments. The dilute ointment still contained a high proportion of paraffins and was assayed by a cold process in which the sample was dissolved in xylene and isopropyl alcohol, treated with aniline and glacial acetic acid, and shaken with zinc powder. Mr. Ferrey was informed (**46**) that the function of the aniline was to remove traces of oxides of nitrogen which occurred in the ointment and interfered with the reduction by zinc.

The strong ointment was assayed by a similar cold process (used also for the two ointments of mercury) but here the addition of aniline was omitted, although the ratio of oxides of nitrogen to zinc was 20 times that in the assay of the dilute ointment. The BP assay was in any case unsatisfactory because the ointment contained a high proportion of water and was not completely soluble in benzene, the prescribed solvent. In Mr. Ferrey's hands, it gave low and erratic results. He had found refluxing with a mixture of equal volumes of nitric acid and water satisfactory, and good recoveries of mercury had been consistently obtained by the following simple method:

The sample of ointment was boiled under reflux with the 1:1 acid for 15 minutes and cooled thoroughly without disturbing. The acid solution was poured off from the cake of paraffins and the flask washed out with water; a further quantity of the acid was added and the refluxing repeated for a few minutes, cooling and pouring off as before. Finally, the condenser tube was washed out with dilute nitric acid and the combined solutions titrated with thiocyanate after suitable dilution with water.

TABLE IV

Strong ointment of mercuric nitrate (7.0% *Hg*)

Sample I	*BP Method*:—6.52; 6.67% Hg		
	Extraction with 1:1 HNO_3:—		
	1st extn.	6.84	6.85
	2nd extn.	0.15	0.10
	3rd extn.	nil	nil
		6.99% Hg	6.95% Hg
Sample II	2 *Extns. with* 1:1 HNO_3:— 6.99; 6.94; 6.94; 6.92% Hg		

TABLE V

Assay of mercury ointment

Method	% Hg			
BP Method	30.2	30.1	30.1	30.1
2 extns. with 1:1 HNO_3 ..	30.1	30.0	29.9	30.0

OF MERCURY

Harris (**47**) had suggested a method for mercury ointment, dilute mercury ointment and compound mercury ointment, in which he refluxed the sample with nitric acid and water, and then repeated the refluxing three times using water only. This procedure gave results about one per cent lower than the two acid extractions. Winkler (**48**) also extracted mercury ointments with 50 per cent nitric acid after dissolving the base in chloroform. His method gave good results.

Ointments containing mercurous chloride, ammoniated mercury, or mercuric oxide could be assayed conveniently by refluxing with zinc and acetic acid in the presence of potassium iodide and xylol (**49**). The official assay of ammoniated mercury ointment was an extension of the acidimetric assay of the drug itself. The official assay of calomel ointment (BP 1948) involved filtering off the calomel from a solution of the base in ether, a process which was difficult to carry out without loss, and which required considerable attention at least. Heading had suggested centrifuging (**50**), but this was not very satisfactory.

TABLE VI

Ointments of mercuric oxide, ammoniated mercury and calomel

	% Hg		% NH_2HgCl
Ointment of red mercuric oxide	9.93 (Allport)	Ammoniated mercury ointment	5.11 (Allport)
	9.88 (HNO_3 extn.)		5.14 (BP assay)
	9.83 (Zn-aectic)		5.11 (BP assay)
	9.81 (Zn-acetic)		4.82 (BP assay)
			4.97 (Zn-acetic)
Yellow mercuric oxide ointment for the eye, BP	1.02 (Zn-acetic)		5.01 (Zn-acetic)
	1.01 (Zn-acetic)		5.02 (Zn-acetic)
Calomel ointment	Heading's method:—19.82; 20.00% Hg Zn-acetic method:—19.87; 19.75; 19.89; 19.77% Hg		

(to be continued)

REFERENCES

(1) Mundy & Rix, *Quart. J. Pharm.*, 1932, **5**, 438.
(2) Eckert, *Industr. Engng Chem. (Anal.)*, 1943, **15**, 406.
(3) Sloviter, McNabb & Wagner, *ibid*, 1941, **13**, 890.
(4) Rupp, *Arch. Pharm. Berl.*, 1905, **243**, 300.
(5) Stschigol, *Z. anal. Chem.*, 1934, **96**, 330.
(6) Rauscher, *Industr. Engng Chem. (Anal.)*, 1938, **10**, 331.
(7) Rotondara, *J. Amer. Pharm. Ass.*, 1944, **33**, 353.
(8) Green, Green & Powers, *Bull. nat. Formul. Comm.*, 1947, **15**, 192, 101.
(9) Bartlett & McNabb, *Industr. Engng Chem. (Anal.)*, 1947, **19**, 484.
(10) Robinson, *Analyst*, 1929, **51**, 145.
(11) Howard, *J. Soc. chem. Ind. London*, 1904, **23**, 151.
(12) Treadwell & Hall, *Analytical Chemistry*, Vol. II, 1942, 55.
(13) Scott & Furman, *Standard Methods of Chemical Analysis*, Vol. I, 1939, 578.
(14) *Methods of Analysis*, AOAC, 1955, 75.
(15) Karaoglanov, *Z. anal. Chem.*, 1943, **125**, 406.
(16) Rupp, *Arch. Pharm. Berl.*, 1903, **241**, 444.
(17) Kolthoff & Stenger, *Volumetric Analysis*, Vol. II, 1947, 337.
(18) Kolthoff & van Berk, *Z. anal. Chem.*, 1927, **71**, 339.
(19) Cumming & Spice, *J. Pharm. London*, 1952, **4**, 321.
(20) Kolthoff & Stenger, *Volumetric Analysis*, Vol. II, 1947, 338.
(21) Ferrey, *Year Book, Pharm.*, 1927, 598.
(22) Patridge & Cooper, *Pharm. J.*, 1948, 352.
(23) Incze, *Z. anal. Chem.*, 1917, **56**, 177; 1918, **57**, 176.
(24) Kolthoff & van Berk, *ibid*, 1927, **71**, 339.
(25) Rupp, *Chemiherztz*, 1908, **32**, 1088.
(26) Rupp & Miller, *Apotherheztz*, 1925, **40**, 539.
(27) Tagliavini, *abs. Analyst*, 1918, **43**, 35.
(28) Holdermann, *Arch. Pharm. Berl.*, 1905, **243**, 600.
(29) Rupp, *Pharm. Zental.*, 1926, **67**, 145.
(30) Rupp & Lehmann, *Pharm. Ztg. Berl.*, 1907, **52**, 1014.
(31) Kolthoff & Stenger, *Volumetric Analysis*, Vol. II, 1947, 207.
(32) Andrews, *Amer. Chem. J.*, 1903, **30**, 1903.
(33) Rupp, *Chemiherztz.*, 1908, **32**, 1077.
(34) Kolthoff & Kaijzer, *Pharm. Weekbl.*, 1920, **5**, 913.
(35) Roberts, *Year Book Pharm.*, 1924, 719.
(36) Brindle, *Quart. J. Pharm.*, 1932, **5**, 243.
(37) Fitzgibbon, *Analyst.*, 1937, **62**, 654.
(38) Stüwe, *abs. Analyst*, 1914, **39**, 233.
(39) Brindle & Waterhouse, *Quart. J. Pharm.*, 1936, **9**, 519.
(40) Sage & Stevens, *Chem. & Drugg.*, 1932, **116**, 84.
(41) Heading, *Quart. J. Pharm.*, 1934, **7**, 413.
(42) Hampshire & Page, *ibid*, 1935, **8**, 75.
(43) Ferrey, *ibid*, 1938, **11**, 431.
(44) *Idem*, *ibid*, 1939, **12**, 413.
(45) Street, *Analyst*, 1936, **61**, 687.
(46) Stuckey, Private Communication.
(47) Harris, Private Communication.
(48) Winkler, *abs. Quart. J. Pharm.*, 1931, **4**, 593.
(49) Ferrey, *Quart. J. Pharm.*, 1941, **14**, 168.
(50) Heading, *ibid*, 1934, **7**, 406.

SIMA's Fifth Annual Convention

THE FIFTH annual convention of the Scientific Instrument Manufacturers' Association will be held at Eastbourne from 11-14 October. The guest speaker on the opening day will be Mr. Stanley J. Harley, B.Sc., M.I.Mech.E., of the Coventry Gauge & Tool Co. Ltd.

The theme will be 'Production 1957' and the following panels and sessions have been arranged:—Production 1 (general, optical and mechanical); Production 2 (electrical and electronic); Research & Development; Marketing.

Sir Bernard Keen, D.Sc., F.R.S., of Baird & Tatlock (London) Ltd., will take the chair of the research and development panel, when the following papers will be read:—'The Industry and SIRA,' by Dr. J. Thomson, M.A., D.Sc., F.Inst.P., M.I.E.E., of the British Scientific Instrument Research Association; 'Problems of Academic and Industrial Research,' by Professor J. D. McGee, O.B.E., Ph.D., of Imperial College of Science & Technology; and 'Sponsored Research,' by Mr. A. S. D. Barrett, B.Sc., M.I.Mech.E., A.M.I.Chem.E., of Edwards High Vacuum Ltd.

AEA Publications

TWO LISTS of publications available to the public have been issued by the UK Atomic Energy Authority. *List No. 9—August 1956* and *List No. 10—September 1956*, both compiled by the library of the Atomic Energy Research Establishment, Harwell, contain details of original documents and translations issued by the Atomic Energy Research Establishment and the Industrial Group of the UKAEA, together with articles in periodicals contributed by the Authority's staff. Documents are deposited in the following UKAEA depository libraries: Science Museum Library, South Kensington, London SW7; Central Library, Ratcliff Place, Birmingham 1; The Mitchell Library, North Street, Glasgow C3; Central Library, William Brown Street, Liverpool 3; Central Library, St. Peter's Square, Manchester 2; Central Library, New Bridge Street, Newcastle-upon-Tyne 1; and Central Library, Surrey Street, Sheffield 1. The documents may be borrowed or photocopies obtained from these libraries. They are also deposited in the copyright libraries and in the Patent Office Library.

Distillation Unit

Shell Haven Refinery Capacity to be Doubled

A NEW crude distillation unit, which will almost double the capacity of the refinery, is planned to come on stream at Shell Haven, in the Thames estuary, by the end of 1958. The new distiller is designed for 11,000 tons/day (80,000 bbls/day) of crude and will raise the refinery capacity to 7¼ million tons per annum. Total cost of the new unit is estimated at £6½ million.

This new plant incorporates several novel features, one of which is the furnace which will be one of the largest in use in the oil industry, having a heat absorption of over 200 million BTU/hour.

The distillation unit will be erected by E. B. Badger & Sons Ltd. who have designed it to the latest Shell standards. When this unit comes into operation it will raise the capacity of the four UK refineries operated by Shell Refining & Marketing Co. to nearly 15 million tons per annum.

After passing through the furnace the crude enters the main tower which produces fuel oil directly as bottom product. The new unit will also make as a single stream, the special naphtha cut fed to the platformer for production of highest grade motor gasoline.

Great care in the design of the unit has been given to all aspects of atmospheric and water pollution. The unit is arranged for total condensation of all hydrocarbon gases produced from the crude oil, the single vent being completely closed except in the rare event of cooling water failure.

Condensation is entirely by surface condensers so that mixture of any oil with the cooling water is avoided. Special attention is also given to de-oiling of the drainage water by interceptors of the latest design.

Instrument Display

THE THIRD instrument display, organised by the Scientific Instrument Manufacturers' Association, was recently opened at SIMA House, 20 Queen Anne Street, London W1. This latest display shows a further cross-section of the British instrument industry and will remain open until the end of the year. Although it is a permanent exhibition, it will allow some interchange of equipment by members during this period.

Besides seeing working demonstrations of various types of instrumentation, visitors are able to state their problems or requirements and obtain detailed information from the catalogue reference library.

CHEMICAL STOCKS & SHARES

Suez Problem Upsets Profits

BUSINESS in stock markets has continued to be restricted by Suez Canal uncertainties, and buyers were cautious, although on the other hand, selling has been moderate and this gave share prices a steadier appearance. It is now generally realised that rising costs, which may very well be accelerated unless there is an early solution to the Suez problem, are reducing profits in a wide range of industries.

Nevertheless, it is being pointed out that many shares have declined in recent weeks to levels at which yields are not unattractive on the basis of maintained dividends, and that in the circumstances, markets could be expected to rally well if sentiment had the benefit of a really favourable turn in international news.

Profit Margins Less

It is clear from the half-yearly figures issued by well-known companies that profit margins in important sections of the chemical industry are falling because of rising costs. In fact, Brotherton say that they may not be able to maintain their total dividend at last year's 17½ per cent. It should not be overlooked that the problem of rising costs is a fairly general one these days and that many companies in other industries besides chemicals, have reported declining profits.

An important point is that, as far as chemical companies are concerned, the lower profits are due in a large measure to the fact that higher costs have not been passed on to the public. This policy, which Imperial Chemical Industries have followed, is a sound one from the long term point of view because it aims at expanding turnover at home and overseas.

As was to be expected chemical shares have moved fairly closely with the general trend in stock markets. Imperial Chemical were 42s 9d compared with 44s 6d a month ago. Brotherton 10s shares, which were under the influence of the fall in the half-yearly profits, have declined on the month from 29s 4½d to 25s 3d. Hickson & Welch 10s shares lost 1s at 28s 6d, and despite the good impression created by the half-yearly profits, Albright & Wilson 5s shares were affected by doubts expressed whether the upward trend in profits would continue, and the shares have come back from 20s 1d to 19s 3d xd.

Fisons at 51s 3d lost only a few pence on balance, while Laporte 5s shares were 17s 3d, compared with 18s a month ago.

Morgan Crucible 'A' shares became active and higher at 44s, a rise of 2s on the month. W. J. Bush ordinary and 'A' ordinary shares were both quoted at 62s 6d, and after easing, Powell Duffryn 10s shares strengthened to 20s 3d. Negretti & Zambra 5s shares were steady at 16s and Frederick Braby shares have been dealt in around 30s. T. W. Ward were firm around 60s 9d with Staveley shares at 54s 9d.

Monsanto 5s shares were 24s 3d, compared with 25s 6d a month ago, and elsewhere, British Drug Houses 5s shares at 13s 3d have been well maintained. Boots Drug 5s shares at 14s 6d were also the same as a month ago. Anchor Chemical 5s shares eased from 12s to 11s 6d. Hardman & Holden 5s shares lost 6d at 10s 6d. British Glues 4s shares were 9s 9d compared with 9s 6d a month ago, while William Blythe 3s shares at 11s 9d xd compared with 12s. Greeff-Chemicals Holdings 5s shares have gained 1s at 16s 9d.

General Refractories 10s shares were 31s 6d or virtually the same as a month ago. There was again a large business in Borax Holdings, but like most other shares in which American investors have become interested, they have reflected the recent reaction in Wall Street, and were £13 11/16 compared with £14¾ a month back. Triplex Glass 10s shares were 33s 3d.

Diverse Interests

F. W. Berk 5s shares were 7s xd compared with 7s 4½d while Coalite & Chemical 2s shares again changed hands around 4s. Yorkshire Dyeware & Chemical 5s shares came back from 9s 3d to 8s 6d. The 6s 8d units of The Distillers Co. have firmed up to 21s on further consideration of the statements of Sir Henry Ross at the annual meeting. He emphasised that the diversification of the group's interest is to the advantage of shareholders, and stated that the various sections were doing satisfactorily, but did not give the proportion of profits each section contributes to the annual results. In fact there are few companies with diversified interest who do this.

British Chrome Chemicals 5s shares have changed hands around 10s. British Industrial Plastics 2s shares at 4s 10½d were virtually unchanged. British Xylonite came back from 25s 6d to 24s 9d. Reichold Chemical 5s shares were 15s 9d and Ashe Chemical 1s shares changed hands around par. Lawes Chemical 10s shares were 15s xd. Oils fluctuated with the Suez news. Shell were 154s compared with 150s 7½d a month ago.

CORROSION PREVENTION

BP Research Results

AS REPORTED briefly in THE CHEMICAL AGE of 22 September (p. 542) the British Petroleum Co. has done extensive research on the elimination of low temperature corrosion resulting from the presence of sulphur compounds in flue gases. The September issue of the *Journal of the Institute of Fuel* contains an article, 'The Prevention of Acid Condensation in Oil-Fired Boilers' by L. K. Rendle and R. D. Wilsdon of BP's Sunbury research station which describes in some detail the work carried out and the conclusions drawn.

The bulk of the sulphur compounds in the fuel are oxidised to SO_2 but a small proportion is further oxidised to SO_3. Even a very low concentration (0.002 to 0.005 per cent by volume) of SO_3 causes a rise in the dew point from *ca.* 40 to 45°C to *ca.* 140°C. Sulphuric acid may condense on any surface at or below the dew point.

To prevent acid condensation on economisers and air heaters it has been the practice to maintain these at temperatures well above the acid dew point, thus providing protection at the expense of thermal efficiency.

There are three main classes of materials which may be used for depressing the acid dew point of flue gases:

(a) Materials which physically absorb SO_3, such as silica or carbon.

(b) Materials which combine preferentially with the atomic oxygen present in the flame zone or which promote recombination of the oxygen atoms with consequent inhibition of the reaction:

$$SO_2 + O \rightarrow SO_3$$

(c) Materials which combine chemically with SO_3 to form non-corrosive compounds which are carried away by the combustion gases.

Materials from all these classes were tested but all the materials which were successful in eliminating the acid dew point belonged to class (c). With one exception the materials in group (c) were solids which suffered from the disadvantage that efficiency depended on the state of sub-division.

It was found that the addition of ammonia to the combustion gases at a temperature of *ca.* 300°C was the most effective and cheapest method of eliminating the acid dew point. As ammonia is a gas the contacting efficiency is high and the injecting equipment is simple and requires very little maintenance.

The products formed, ammonium sulphate and ammonium bisulphate, will be mostly carried away in the flue-gas stream. A certain amount will solidify on cooler surfaces but it is anticipated that corrosion should be negligible.

Norway's Chemicals

ACCORDING to the *OEEC Statistical Bulletin* Norway's exports of chemicals in 1955 amounted to 57 million US dollars, the same figure as for 1954. The corresponding figure for 1953 was $49 million. The figures for imports of chemicals for 1953, 1954 and 1955 are $35 million, $42 million and $48 million.

PAKISTAN DEVELOPMENTS

Plastics Raw Materials

PHENOL FORMALDEHYDE is the only plastics raw material manufacture in Pakistan. It is produced by a company in Wazirabad who claim an output of 100 lb. daily, mainly for use in its own electrical accessories section. The Wazirabad factory plans to purchase additional machinery to increase its output to 500 lb. daily. The company then hopes to be in a position to market the plastic at 10-20 per cent below the price of the imported article.

Approximate annual quantities of plastics powders and sheets used by the plastics industry are as follows: phenol formaldehyde, 150-200 tons; polystyrene, 600 tons; methyl methacrylate sheets, 70 tons; cellulose acetate, 50 tons; p.v.c. (plasticide), 20 tons; p.v.c. (polymer), 100 tons (used exclusively by a factory producing leather cloth), and polythene, 25-30 tons. Generally speaking there are no regulations and standards pertaining to plastics raw materials. Where occasionally a standard is quoted, it is British Standard Specification.

Users of plastics raw materials are located chiefly in the Karachi area and to a lesser extent in the Punjab and North West Frontier Province. The manufacturing industry in East Pakistan is very small, there being only nine manufacturers, who are almost entirely situated around Dacca. Plastics powders are admitted free of duty into Pakistan, but are liable to 10 per cent sales tax; plastics sheets carry duty at the rate of 37½ per cent *ad valorem* plus 10 per cent sales tax.

Chemist's Bookshelf

AN INTRODUCTION TO CRYSTALLOGRAPHY. 2nd edn. *By* F. C. PHILLIPS. Longmans, Green & Co. Ltd., London. *1956.* Pp. 324. *30s.*

The first edition of this excellent text-book appeared in 1946 and was followed by two reprintings. This new edition will be greatly welcomed by teachers and students alike, because the first edition, when out of print, was usually so valuable to its owner as a work of reference that very few copies found their way into secondhand bookshops. This reviewer cannot do better than echo the writer of the first review in this paper: 'A very lucid introduction to the study of crystals. . . . There can be no hesitation in welcoming it as a contribution of real value to the student and practising crystallographer alike'. It has, in fact, proved to be a 'must'. No better introduction to crystallography exists for mineralogist, chemist or physicist, whether the subject is to be studied deeply or as a small section of some wider field.

The new edition is larger than the old, because it contains a chapter on the Diffraction of X-rays by Crystals. The treatment is elementary and does no more than hint at the many methods that are now available for detailed crystal structure analysis, both experimental and theoretical. It is perhaps a pity that no references are given to the many good text-books from which an interested reader might gain further information, and that the biographical footnotes that are such a delightful feature of the earlier part of the book are not continued here. Apart from this new chapter there are only a few changes. In particular the nomenclature has been slightly modified to bring it into accord with that now standardised in the international tables for X-ray crystallography, and a few of the very numerous figures have been improved.

As in the first edition, there are many tables, a good general index and an index of formulae. One rather important misprint on page 291 is that $h=l=2n$ should be $h+l=2n$. KATHLEEN LONSDALE

THE PETROLEUM ACIDS AND BASES. *By* J. L. LOCHTE & E. R. LITTMANN. Constable & Co. Ltd., London. *1956.* Pp. 368. *50s.*

This book is an unusual one because not only does it deal with a highly specialised topic but the work which has been carried out has been in some way isolated from the main stream of chemical research. As such the book is not likely to have an immediate appeal to a wide range of chemical readers.

To an increasing extent we may expect the chemical industry in this country to turn to crude petroleum for its source of raw materials and intermediates for the synthesis of organic chemicals. Some of the materials described in the text, such as the naphthenic acids, will be familiar enough from their use in the paint industry; others, such as the highly alkylated pyridines, will be new as will the uses suggested for them.

Text is divided into 28 very short chapters, some only a few pages in length. Each has a list of references at the end. In the case of the petroleum acids, separate chapters are devoted to the separation, isolation and characterisation of the products and to the separate classes. Descriptions of the work carried out by individuals, such as von Braun, give the effect of a report on work in progress rather than a manual. Coverage is good, with the exception of the chapter dealing with the salts and derivatives of naphthenic acids where the treatment appears superficial considering the commercial significance of the products.

The petroleum bases which consist mainly of alkylated pyridines and quinolines are discussed in some detail, but the examination of their possible commercial utilisation is not encouraging, at least as far as large scale operations are concerned. Some space is also devoted to speculations upon the probable origin of the acidic and basic constituents of crude petroleum. J. R. MAJER

PRINCIPLES OF PHYSICAL METALLURGY. *By* M. C. SMITH. Constable & Co. Ltd., London. *1956.* Pp. 417. *50s.*

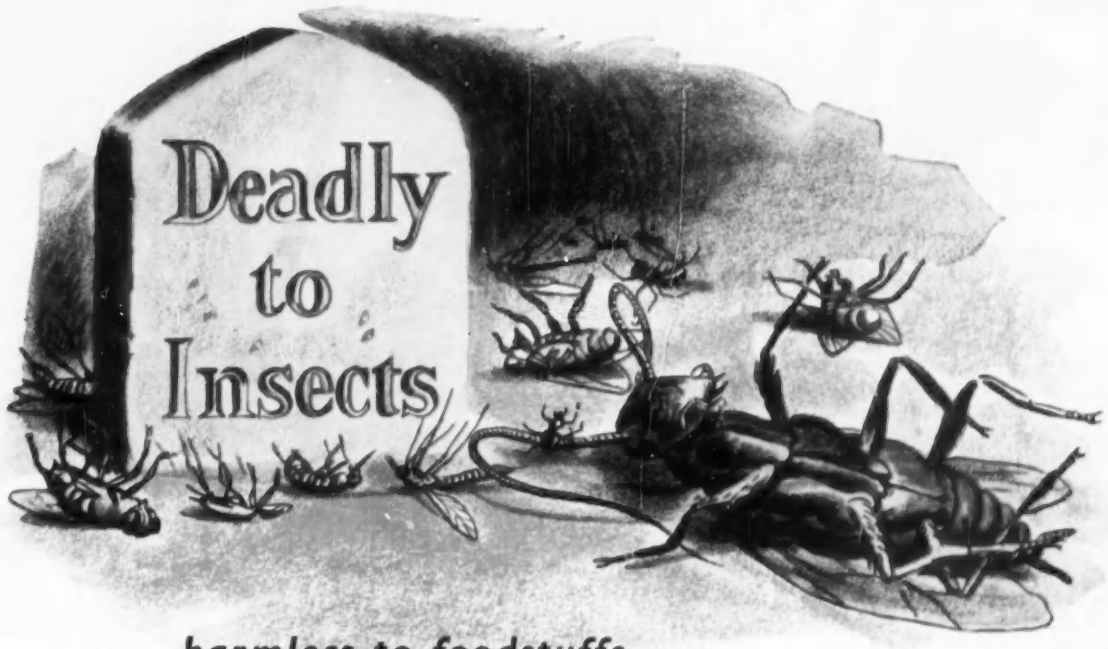
A US book which can be wholeheartedly recommended as an excellent introduction, very clearly set out, to the basic physical aspects of metallurgy. The price is not low, but the contents are clear and readable; there are a moderate number of photographs and diagrams.

Possibly a way of indicating the scope of the book is to relate the chapter headings. A good introduction to the necessary background of the modern theory of the atom is given. This is followed by a detailed discussion of crystallography, which only towards the end would be rather tough going for the average man.

Crystal structures are dealt with, then comes a short chapter on polymorphism in which examples are, in the main, taken from significant metallurgical cases. A long chapter discusses theories and practical significance of crystal imperfections; it is indeed welcome to note the distinction made between reasonably certain theories, and the region where our knowledge is imperfect and no certain theory capable of conclusive proof has emerged.

In the sixth essay the electric and magnetic properties of metals are discussed and there follows a long discourse on metal deformation. Then the effects of permanent deformation are related, and those of increase in temperature. Finally, fracture is discussed.

Such a complex subject precludes a full discussion of the book, but its excellence is emphasised. It is certainly one to be recommended to all who are interested in the topic. H.M.



. . . harmless to foodstuffs

Pyrethrum-based Insecticides

PYRETHRUM
is a *must* in the formulation of modern insecticides. Deadly to insects, Pyrethrum is harmless to animals and humans and perfectly safe when used in close proximity to foodstuffs.

PYRETHRUM
combines very high 'knock-down' properties with effective killing power. Insects do not develop resistance to Pyrethrum, as they do to some chemicals which appear highly effective at first but which speedily lose their killing power.

Use Pyrethrum in the blending of insecticides and you will have a product which *really* does its job.

Detailed information and advice on the formulation of Pyrethrum insecticides for Domestic, Industrial and Horticultural purposes available on request.

P·Y·R

AFRICAN PYRETHRUM

MITCHELL COTTS & CO. LTD.
Winchester House, Old Broad Street, London, E.C.2
Telephone: LONdon Wall 6000

Overseas Agents to:—
The Pyrethrum Board of Kenya, NAKURU, Kenya Colony.
The Pyrethrum Board of Tanganyika, MBEYA, Tanganyika Territory.
Societe Co-operative des Produits Agricoles, GOMA, Belgian Congo.

Research in Industry

International Conference at the NPL Teddington

SPEAKING at an international conference of research directors during a symposium on the Direction of Research Establishments, held at the National Physical Laboratory, Teddington, from 26-29 September, Professor J. D. Bernal, professor of physics, University of London said he considered industrial research laboratories often failed to recognise that the clues to answers to many of the problems of industrial research already existed. This was due to lack of liaison between laboratories working in different fields. If a proper system of liaison could be evolved between industrial and academic research through the material laboratories and their information sources, then valuable information could be provided for industrial projects.

Mr. D. R. Willson, Technical Section of the Atomic Research Establishment, Harwell, stressed the marked influence that administration systems could exert for good or ill on the working of a research organisation. He felt that the real capital of a research establishment was to be found in the research staff and not in its more conventional types of capital facilities and research equipment.

Rare Earths

ALL the rare earth oxides are available from Johnson, Matthey & Co. Ltd., London, EC1. The chemistry of the rare earths has for some years been one of the research projects in the company's laboratories; methods for the extraction and separation of these elements have been developed and substantial quantities of raw materials have been processed. It is understood that Johnson, Matthey supply all the rare earth oxides to a high degree of purity as spectrographically standardised substances, and they can be converted into salts or solutions to order.

Styrene Monomer Plant

FORTH CHEMICALS LIMITED announces that the major expansion of their styrene monomer plant at Grangemouth, Scotland, has been completed and will come into operation this month. It is believed that this expansion, which more than trebles the initial capacity of the plant, will make it possible for British industry to satisfy all present needs for styrene monomer without importing from the dollar area.

Silicone Price Reductions

REDUCTIONS in the home trade price of the main ranges of MS 200 silicone fluids and Releasil fluids and emulsions are announced by Midland Silicones Ltd. The reductions, which became effective from 17 September, vary from 9d per lb. to 1s per lb.

A statement by the company says that these reductions are a result of the continued expansion in the production of silicones at the plant operated by the company in Barry, Glamorgan. Since production commenced at Barry in 1952 several large scale price reductions have been announced. The new prices represent an overall reduction since that year of more than 27 per cent.

Swimming Pool Reactor

HARWELL'S latest research reactor 'Lido' started operating for the first time during the night of 20/21 September. This reactor is intended primarily for shielding studies; one of its major tasks is to assist in the development of submarine propulsion.

It is a 'swimming pool' type reactor in which the enriched-uranium plate-type fuel elements are suspended in a large concrete tank of purified water. The concrete tank is 24 ft. deep by 8 ft. by 28 ft. and is surmounted by a moveable trolley. Suspended from the trolley is a framework supporting the reactor core which is about the size of a tea chest. Shielding experiments are made by moving the core of the reactor close to aluminium windows which are set into the walls of the tank.

The detailed design and construction of the reactor was carried out by a joint Naval and AERE team in association with Vickers-Armstrongs (Barrow), Ltd., Ericssons Telephones Ltd., Rolls-Royce Ltd. and Marston Excelsior.

Tweed Iceberg

A POLYTHENE container has been produced by the plastics division of the Mentmore Manufacturing Co. Ltd. for the Tweed Iceberg—a new solid Cologne stick made by Lentheric Ltd. The container consists of a tube with a knurled rim at the base into which fits a bucket holding the stick. This bucket can be pushed up from the bottom as its contents wear down.

Protective Clothing

PROTECTIVE clothing manufactured from Dynel, Terylene, Courlene and Nylon is obtainable from M. Ley, 4 Shaftesbury Avenue, Kenton, Mddx.

Neoprene & Hypalon

Du Pont Expert Discusses Some Recent Developments

METHODS for improving the properties of neoprene and Hypalon by using modern compounding techniques and vulcanisation were discussed on 20 September by Mr. Neil L. Catton of Du Pont in a paper called 'Neoprene and Hypalon—Recent Developments.' Mr. Catton was speaking before a meeting of the Institution of the Rubber Industry.

He gave a brief review of the chemistry of neoprene and Hypalon and described the advantages of neoprene types WX, WRT, and WHV. Type WX is claimed to combine raw polymer stability with resistance to crystallisation both uncured and after vulcanisation. Late in 1955 Du Pont introduced Hypalon 20, a chlorsulphonated polythene with improved processing characteristics.

Compounds made from Hypalon 20 are claimed to have better building tack, to be less 'nervy' and to have lower viscosity.

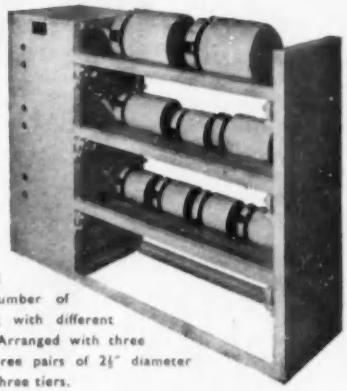
Discussing applications for neoprene and Hypalon Mr. Catton spoke of the uses of neoprene compositions in hoses, seals, gaskets and in moulded parts. Hypalon's inertness to chemical attack especially by strong oxidising acids makes it a suitable material for use in lining tanks and other chemical equipment, as well as for lining in acid hoses.

Hypalon can also be used for flexible, decorative and protective coatings for fabrics, metals, rubbers, masonry and other surfaces.

Fuel Efficiency Service

NIFES (National Industrial Fuel Efficiency Service), one of the two sponsors of the Fuel Efficiency Exhibition, is an independent, non-profit making organisation providing unbiased advice on all problems relating to fuel efficiency. At the exhibition fully-trained engineers are present in the NIFES stand to discuss problems and give advice. Services provided by NIFES include: Detailed heat and power surveys which show exactly where energy is wasted and how such waste can be prevented; checks on the efficiency of any item of fuel-using plant and the thermal efficiency of process equipment; investigations on space heating systems together with advice on insulation of buildings; regular service agreements which ensure that plant brought up to maximum efficiency is maintained at that level; and instruction for boiler operators on correct combustion practice.

for laboratory and small scale production



3-TIER BALL MILL

This new ball mill is a useful unit for carrying out a number of separate jobs or for dealing with different materials at the same time. Arranged with three separate motors and with three pairs of 2½" diameter white rubber bonded rolls in three tiers.

Each pair consists of one driven and one idler roll and the latter can be placed in any of three positions to accommodate containers up to 9" diameter. All three tiers can be operated simultaneously or one or two separately and provision is made for varying the speed of the driven rolls. Each tier will carry two 1-gallon or three ½-gallon or four 2 pint or five 1-pint and various combinations of the different nominal capacities can be operated at the same time.

PASCALL

Write or Telephone Crawley 25166 for List BM710

THE PASCALL ENGINEERING CO. LTD.
GATWICK ROAD · CRAWLEY · SUSSEX

CROMIL & PIERCY LTD.

REGD. CROMIL

GRAPHITE IN ALL FORMS

MILBURN HOUSE,
"E" FLOOR
NEWCASTLE-ON-TYNE
Tel.: 2-7761

JMS

SOLVENTS & PLASTICISERS

Write Dept. B/30 for further details

J.M.STEEL & CO. LTD.
36/38. KINGSWAY LONDON W.C.2 *Tel.* HOLborn 2532/5
BRANCH OFFICES
51. SOUTH KING ST. MANCHESTER 2 *Tel.* Deansgate 6077/9
45. NEWHALL ST. BIRMINGHAM 3 *Tel.* Central 6342/3

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.

D. & S. TAYLOR LTD., London N, manufacturers of scientific glasswork.—6 September, £125 debentures, to R. H. Goodman, Sanderstead; general charge.

MYLES KEARNEY & SONS LTD., Waterford, paint manufacturers etc.—11 September, mortgage debentures securing all moneys due or to become due to the Munster & Leinster Bank Ltd.; charged on 126 The Quay, Waterford; Belgrave Cottage, 23 Oakley Road (formerly Cullenswood Avenue), Dublin, also general charge.

RIVLIN INSTRUMENTS LTD., London WC, scientific instruments.—30 August, £5,250 mortgage, to Eagle Star Insurance Co. Ltd.; charged on Factory 'M', Yorktown Industrial Estate, Camberley. *Nil. 12 March 1956.

Satisfaction

MERTHYR TYDFIL CERAMICS LTD.—Satisfaction, 4 September, of series of debentures registered 1 October 1952 and 19 May 1954.

Changes of Name

STAFFORDSHIRE CHEMICAL CO. (1917) LTD. (147,686), Chatterley, Tunstall, Stoke-on-Trent, Staffs, name changed to Staffordshire Chemicals Ltd., on 1 August 1956.

ANGIER CHEMICAL CO. LTD. (51,329), 209/215 Blackfriars Road, London SE1, name changed to Bristol Laboratories Ltd., on 1 August 1956.

Receiverships

BRITISH LIGNITE PRODUCTS LTD. (433,808), Blue Waters Mine, Bovey Tracey, Devonshire. Richard Langdon Davis, of 58 Theobalds Road, London WC1, ceased to act as Receiver on 14 September 1956.

Increases of Capital

THE TIDEWATER TRADING & MANUFACTURING CO. LTD. (269,319), oil refiners and blenders, soap, grease, candle manufacturers and dealers etc., Compton Works, Watts Grove, Bow, London E3, increased by £4,600 in £1 ordinary shares, beyond the registered capital of £400. Notice registered 7 August 1956.

WITCO CHEMICAL CO. LTD. (337,369), Bush House, Aldwych, London WC2, increased by £90,000, in £1 ordinary shares, beyond the registered capital of £70,000.

LANGSTON JONES & SAMUEL SMITH LTD., oil and tallow refiners etc., Compton Works, Watts Grove, Bow, London E3, increased by £20,000, in £1 ordinary shares, beyond the registered capital of £20,000.

New Registrations

Northern Fertilizers Ltd.

Private company (16,224). Registered in Dublin 5 September. Capital £50,000 in £1 shares. Objects: To acquire, as a going concern, the business known as Dundalk Chemical Manures carried on by Joseph McGinnity at Mill Street, Dundalk. The directors are: Joseph McGinnity and Mrs. Maureen McGinnity, both of Blackrock, Co. Louth.

Jackson & Bell (Chemicals) Ltd.

Private company (572,064). Registered 27 September. Capital £1,000 in £1 shares. Objects: To carry on the business of distributors, wholesalers and retailers of industrial and agricultural chemicals, fertilisers etc. The directors are: Arthur W. Jackson, 18 Castle Hill, Berkhamsted, Herts, and Frank Bell, 4 East Street, Hemel Hempstead, Herts, both directors of Jackson & Bell (Oils) Ltd. Secretary: L. C. Hopkins. Reg. Office: 28 Station Road, Watford.

Orme Scientific Ltd.

Private company (572,076). Registered 27 September. Capital £2,000 in £1 shares. Objects: To acquire the business carried on by Miss Dora Mitchell as Orme & Company in Manchester, and to carry on the business of manufacturers of and dealers in laboratory equipment, chemical, electrical, physical and scientific apparatus, chemicals and drugs etc. The directors are: Dora Mitchell and Alice Mitchell, both of 79 Woodgrove Road, Burnley. Secretary: Dora Mitchell. Reg. office: 17 Russell Street, Manchester 1.

J. W. West Ltd.

Private company (571,946). Registered 25 September. Capital £3,000 in £1 shares. Objects: To carry on the business of manufacturing, retail and wholesale pharmaceutical chemists etc. The directors are: John W. West, M.P.S., Mrs. Constance West and John F. West, Ph.C., all of 97 Minchenden Crescent, London N14. Secretary: J. F. West. Solicitors: H. B. Wedlake, Saint & Co., London WC2. Reg. office: 428 West Green Road, Tottenham, London N15.

Rebro Ltd.

Private company (572,005). Registered 26 September. Capital £1,000 in £1 shares. Objects: To carry on the business of wholesale and retail chemists and druggists etc. The directors are: Donald Townley and Irene Townley, both of 52 Queens Road, Accrington. Secretary: D. Townley. Reg. office; 7-9 Daisy Street, Blackburn.

Strang Chemical Co. Ltd.

Private company (571,551). Registered 14 September. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in chemicals, drugs, pharmaceuticals, and medicines of all kinds etc. The directors are: Ronald W. J. Neve and Eldbjorg M. Neve, both of 25 Palmerston Road, London SW14. Solicitors: Rodgers, Gilbert & Horsley, 7/8 Norfolk Street, London WC2.

British Oxygen Research & Development Ltd.

Private company (571,562). Registered 17 September. Capital £1,000 in £1 shares. Objects: To carry on the business of conducting all kinds of research etc. The directors are: Philip H. Sykes, Elsfield, 21 Malden Road, Wallington, Surrey, director of The British Oxygen Co. Ltd.; Norman Booth, 97 Copse Hill, Wimbledon, London SW20; and Leonard C. Bannister, 7 Castlemaine Avenue, South Croydon, Surrey. Secretary. J. W. Coates. Solicitors: Simpson, North, Harley & Co., 6 York Buildings, London WC2. Reg. office: Bridgewater House, Cleveland Row, St. James's, London SW1.

[*Turn to page 40*

PERMUTIT

ION EXCHANGE MATERIALS

Ion Exchange today performs many tasks in industry, and Permutit manufactures a wide range of these materials. Their application in roles distinct from water treatment has resulted in the development of numerous new industrial processes giving improved results and lower running costs. Some of the materials now available, with their characteristics, are shown below.

ZEO-KARB Na A sulphonated coal product containing both strong and weak acid groups.

ZEO-KARB 215 A nuclear sulphonated phenol resin containing also hydroxyl groups.

ZEO-KARB 225 A unifunctional cross linked sulphonated polystyrene resin in bead form of high capacity and exceptional chemical and physical stability.

ZEO-KARB 226 A unifunctional cross linked methacrylic acid resin in bead form containing only carboxyl groups as the ion active groups.

DE-ACIDITE E A high capacity anion exchange material of medium basicity.

DE-ACIDITE FF A unifunctional very highly basic anion exchange resin in bead form based on cross linked polystyrene and containing quaternary ammonium groups.

DE-ACIDITE G A unifunctional weakly basic anion exchange resin in bead form based on cross linked polystyrene and containing diethylamino groups.

DE-ACIDITE H A material similar to "De-Acidite G" but containing dimethylamino groups.

BIO-DEMINROLIT A mixed cation and anion exchange resin for demineralisation in a single column.

DECALSO F A synthetic sodium aluminium silicate suitable for the separation and concentration of vitamins and hormones.

DECOLORITE-ASMIT A resin of high porosity for removing colour from solutions.

PERMAPLEX C-10 A highly selective cation exchange resin membrane containing SO_3H groups.

PERMAPLEX A-10 A highly selective anion exchange resin membrane containing quaternary ammonium groups.

THE PERMUTIT COMPANY LIMITED

Dept. V.A. 150, Permutit House, Gunnersbury Avenue, London, W.4. Telephone: CHIswick 6431

COMPANY NEWS

From page 38]

Aspro-Nicholas

Group profit of Aspro-Nicholas for the first quarter of the current financial year was £84,000, compared with £234,000 for the same period of last year. Mr. M. A. Nicholas, chairman, said the result was disappointing and undoubtedly due to season fluctuations and the impact of unexpected changes in Government financial policy. He added that actual earnings of the group for July and August indicated a marked improvement for the second quarter. The board anticipated being able to maintain the total annual dividend of 24 per cent (as last year) and accordingly had declared a first interim dividend of six per cent.

Thomas Hedley & Co. Ltd.

Profit for the year ended 30 June 1956 of Thomas Hedley & Co. Ltd. was £743,000. This is onlv a partial recovery from the extremely low figure of £429,000 for 1955. The figure for 1954 was £1,151,000. All figures are after payment of UK tax. For the three years 1954, 1955 and 1956 retained earnings (unappropriated) were very nearly constant at £4,156,000, £4,384,000 and £4,297,000. Turnover for the year was up over the previous year and the volume of branded products was a record for the company. During the past year the company spent £600,000 on research together with £500,000 on new research laboratories now almost completed at Longbenton. Exports have increased considerably in the past five years, from about £300,000 in the year ended June 1951 to £2,500,000 in the past year. The Procter & Gamble international group of companies (of which Hedley is the British member) reports profit for the year ended 30 June 1956 before tax of £43,188,818 and after tax of £21,184,454.

Amber Chemical Industries Ltd.

Total net tangible assets (excluding goodwill and patents) for Amber Chemical Industries on 30 June 1956 were £141,160, compared with £110,374 on 31 December 1955. Speaking at the eighth annual general meeting, held in London on 28 September, the chairman, Mr. Arthur Mortimer, O.B.E., said that the figures, which included the results of the sale of the size making business of The Amber Chemical Co. at the beginning of the year, and the acquisition of the freehold of property occupied by the company at Cubitt Town Wharf, would give shareholders an indication of the improved position of the company. The board, said Mr. Mortimer, had been actively engaged in exploring ways and means of employing the funds so far realised, and several projects were at the moment being considered.

Tall Oil

ACCORDING to the latest edition of *Tall Oil in Industry* tall oil supplies may soon exceed 1,000 million lb. a year. With tall oil consumption continuing its present trend this may be just enough to meet the demand, says the article.

Tall oil is a naturally occurring mixture of fatty and rosin acids which has increased in importance in the last few years. Production in the US is now just behind that of linseed oil and may be expected to exceed it within the next few years. It will then be the third largest vegetable fatty material, after soybean and cottonseed oils.

Tall Oil in Industry is published by the Tall Oil Division, Pulp Chemicals Association, 122 East 42nd Street, New York 17, NY, US.

Plastics Laboratories

THE plastics research and technical service laboratories of Pure Chemicals Ltd. were opened on the Kirkby industrial estate on 26 September. Said to be the first of their kind to be set up in this country, the new laboratories will provide a complete service to the vinyl plastics industry on stabilisation problems.

The laboratories are capable of handling at least five customer-problems simultaneously, in addition to the company's own research. The technical service laboratory is essentially a complete vinyl plastics processing factory on a small scale, equipped to handle all types of process used in the vinyl industry.

Fuel Efficiency Exhibition

LATEST methods for the economic use of coal, gas, electricity, oil and nuclear energy in heating are exhibited at the Fuel Efficiency Exhibition, which was opened at Olympia, London, on Tuesday (2 October) by the Minister of Fuel & Power, Mr. Aubrey Jones. Exhibits include numerous examples of the progress in measuring and controlling instruments, many of them employing electronics. Some 150 of the leading firms in this field are exhibiting, including the gas and electricity authorities and the UK Atomic Energy Authority. The exhibition remains open until next Wednesday (10 October).

MARKET REPORTS

LONDON Conditions on the general chemicals market have shown little change during the past week in prices or demand and the movement, in the aggregate, to home consumers has kept up to recent levels. Materials for the paint and plastics industries are in fair request and contract delivery specifications for the textile trades have covered good quantities. A moderate demand for fertilisers has been reported. There has been a steady outlet for supplies on the coal-tar products market, with cresylic acid and crude carbolic acid in good request.

MANCHESTER One or two leading outlets for heavy chemicals are taking somewhat smaller supplies. In spite of this, contract deliveries are reported on the Manchester market to be reasonably satisfactory in the aggregate, with a fair number of fresh inquiries from home users and from shippers coming forward. Prices generally are firm, with borax and boric acid, which are meeting with a steady demand, £1 a ton dearer for all grades from the beginning of the present week. A moderate business is passing in fertilisers, with a steady demand reported for the tar products.

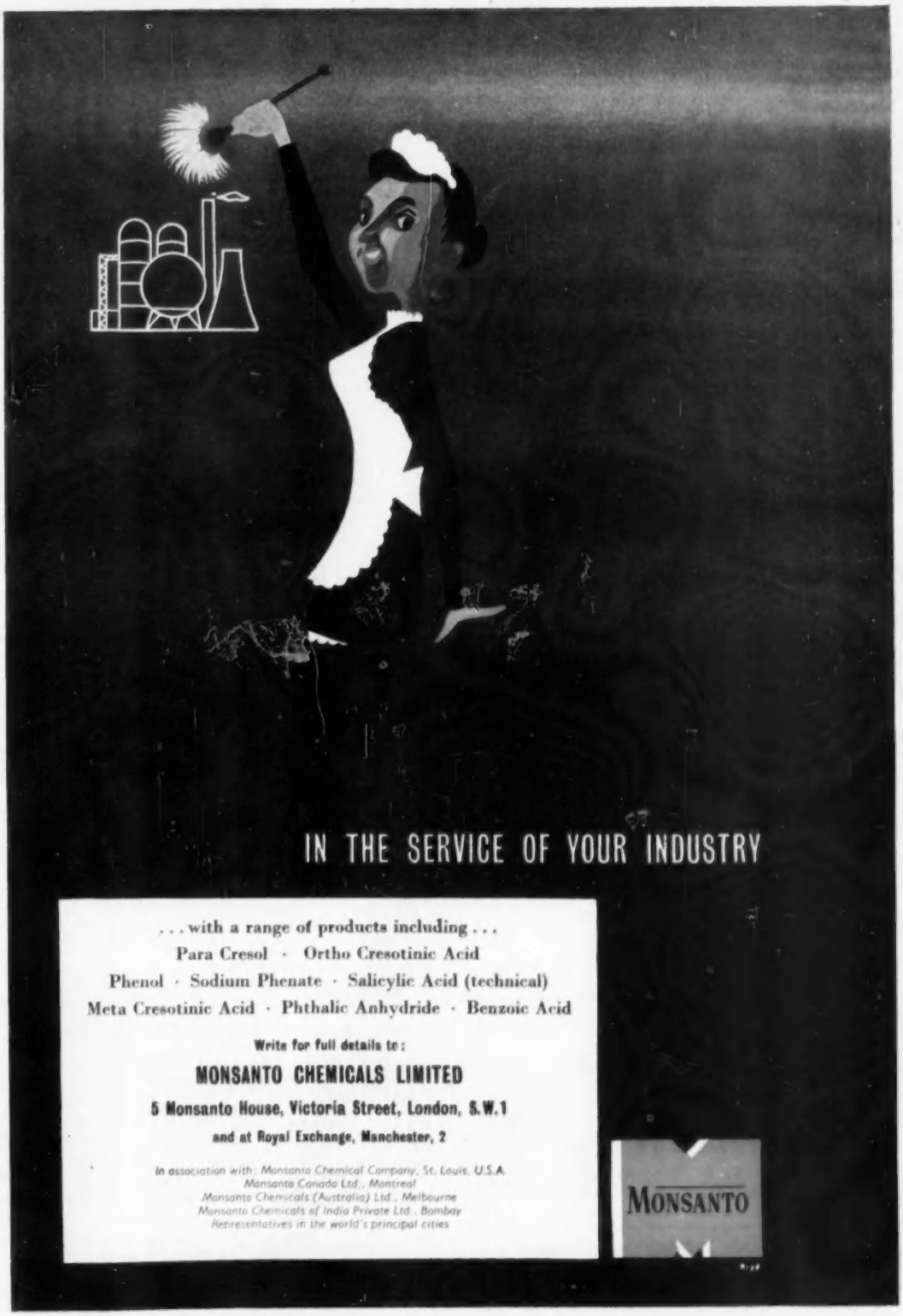
GLASGOW The past week has shown an improvement with business fairly active. Altogether a brisk week's trading has to be reported from the Scottish market. The demand has been general, covering quite a varied range of chemicals. Little or no alteration in prices has taken place, and on the whole they have remained fairly firm. The export market continues steady.

WILLS

MR. THOMAS HAROLD READE, of 225 Great Western Road, Aberdeen, retired university lecturer, and a director of Reade Bros. Ltd., manufacturing chemists, Wolverhampton, who died on 24 March last, left personal estate in England and Scotland valued at £16,542 16s 2d.

SIR RICHARD LLOYD-ROBERTS, C.B.E., of Morants Court near Sevenoaks, for many years chief labour officer to ICI, and member of the Industrial Disputes Tribunal, who died on 29 July last, aged 71 years, left £20,657 9s 9d gross, £19,412 11s 2d net.

MR. WILFRID GUSTAV POLACK, of 294 Hagley Road, Birmingham, who died on 19 July last, left £54,998 7s 3d gross, £54,074 11s 9d net.


IN THE SERVICE OF YOUR INDUSTRY
. . . with a range of products including . . .
Para Cresol · Ortho Cresotinic Acid
Phenol · Sodium Phenate · Salicylic Acid (technical)
Meta Cresotinic Acid · Phthalic Anhydride · Benzoic Acid
Write for full details to:
MONSANTO CHEMICALS LIMITED
5 Monsanto House, Victoria Street, London, S.W.1
and at Royal Exchange, Manchester, 2
In association with: Monsanto Chemical Company, St. Louis, U.S.A.
Monsanto Canada Ltd., Montreal
Monsanto Chemicals (Australia) Ltd., Melbourne
Monsanto Chemicals of India Private Ltd., Bombay
Representatives in the world's principal cities
MONSANTO

Classified Advertisements

CLASSIFIED RATES: All sections 5d. per word. Minimum 8/-. Three or more insertions 4d. per word. Box Number 2/- extra. Up to mid-day Tuesday for insertion same week.

SEMI-DISPLAY: 30/- per inch. Three or more insertions 25/- per inch.

SUBSCRIPTION: Annual Subscription of 52/6 brings 52 weekly copies of THE CHEMICAL AGE direct to your address from the printer (postage paid by the publishers), and a copy of THE CHEMICAL AGE YEAR BOOK.

COMPANY MEETINGS AND REPORTS: £12.12.0 per column. Three column measure (approximately 360 words).

SITUATIONS VACANT

CHEMIST—**JAMES KEILLER & SON, LTD.**, 9 Albert Square, Dundee, manufacturers of Chocolate, Sugar Confectionery, Preserves and Bakery products, have a vacancy in their Dundee laboratories for a qualified chemist, preferably but not necessarily an Honours Graduate. Experience in the food industry would be an advantage but not essential. Permanent position with good prospects.

CHEMISTS

Vacancies exist with the Operations Branch of the Industrial Group of the **UNITED KINGDOM ATOMIC ENERGY AUTHORITY**, at **DOUNREAY WORKS, THURSO, CAITHNESS, SCOTLAND.**

DUTIES:—To be responsible to a Group Manager for the efficient operation of a production section of a Chemical Works. The work entails shift duties.

QUALIFICATIONS & EXPERIENCE:—Applicants should hold an Honours Degree in Chemistry or have equivalent qualifications. Considerable experience in operating Chemical Plant and supervising industrial labour is essential. The successful candidate will be given a period of training at another of the Authority's works.

SALARY:—Will be assessed within the scale £1,235 to £1,655 per annum. A contributory Pension Scheme is in operation.

Houses for renting by the Authority's staff are in course of erection at Thurso and there is hostel accommodation for single and unaccompanied married persons. Financial assistance towards removal expenses may be given in certain cases as well as towards legal expenses incurred in private purchase.

Suitably qualified persons are invited to send a **POSTCARD** quoting reference 1,613 for application form to the Recruitment Officer, U.K.A.E.A., I.G.H.Q., Risley, Warrington, Lancs.

Closing Date—19th October, 1956.

CHIEF CHEMIST required to take charge of Works Laboratories and to advise on chemical control of production processes. He should be a Chemist or Chemical Engineer with good qualifications, training and experience. Some organic chemical experience is desirable but not essential. Applications giving details of age, experience and qualifications, should be addressed to the **GENERAL MANAGER, LAPORTE CHEMICALS LTD., BARONET WORKS, WARRINGTON.**

PLANT MANAGER required to take control of chemical processes. The candidate should have a degree in chemistry, engineering or chemical engineering and wide experience in the chemical, petroleum chemical or tar industries. The position offers possibilities of advancement and a high salary will be paid to the man who proves a success.

Applications should be sent to the **GENERAL MANAGER, LAPORTE CHEMICALS LTD., BARONET WORKS, WARRINGTON.**

WANTED YOUNG ORGANIC CHEMIST for technical sales of industrial chemicals made by Rohm & Haas, U.S.A. and their English subsidiary. Technical sales experiencs required. Excellent opportunity. Send curriculum vitae to **BOX NO. C.A. 3496, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

OFFICIAL APPOINTMENTS

SENIOR SCIENTIFIC OFFICER required by **MINISTRY OF FUEL AND POWER**, for work at Headquarters, London, in connection with conception and development of novel sources and uses of fuel and power, and for supervision of coal-study laboratory, National Gas Turbine Establishment, Farnborough, Hants. Qualifications: Honours degree, mechanical engineering or equivalent. Experience of prime mover fuel and thermodynamic design advantageous. Salary: £1,135×40—£1,215×50—£1,345 (men). Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting C655/6A.

FOR SALE

MORTON, SON AND WARD, LIMITED, STAINLESS STEEL VESSELS

VESSELS of all shapes and sizes, jacketed or unjacketed—with stainless steel mixing gear to requirements; also stainless steel storage tanks and vauum vessels.

"**MORWOOD**" "**U**"-**shaped TROUGH MIXERS**—up to 2 tons, in stainless steel, with agitators, scroll or paddle type, jacketed or unjacketed.

Stainless Steel **TROUGHS, TANKS** and **CYLINDERS** made to requirements.

These items can also be fabricated in mild steel.

JACKETED PANS

100g., 150g., and 200g., new, in mild steel, for 100 lb. p.s.i. w.p.—with or without mixing gear.

3 **cwt. TROUGH MIXERS** by **CHALMERS** and **GARDNER**—stainless steel-lined troughs.

50g., 75g. and 100g. heavy duty **MIXERS** by **FALLOWS** and **BATES**. Agitators driven through bevel gears from fast and loose pully.

200g. cast-iron **JACKETED MIXING VESSEL** with nickel-chrome impellor type agitator driven through bevel gears from fast and loose pulley.

BROADBENT HYDRO EXTRACTORS

21 in. **EQUAL TO NEW**, galvanized baskets, electrically driven through centrifugal clutch or belt driven. Safety inter-locks.

AIR COMPRESSORS

THREE 30 c.f.m. at 100 lb. pressure, water cooled, automatic overloads, with or without motors.

AIR RECEIVERS MADE TO REQUIREMENTS PUMPS

Selection of new MONO and second-hand Pumps in stock—2 in. to 5 in.

Inquiries Invited.

MORTON, SON AND WARD, LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM,
Lancs.
Phone Saddleworth 437

MIXERS—1 Baker Hand-tilted Trough, 16 in. by 24 in. by 20 in. Fast and loose pulleys and clutch. "Z" blades.

1 Ditto Power-tilted Trough, 30 in. by 20 in. by 24 in. Pulley drive and clutch. Four "L" blades.

THOMPSON & SON (MILLWALL), LTD.,
LONDON, E.14.
TEL.: EAST 1844

BOX NUMBERS: *Reply c/o "The Chemical Age" · Bouverie House · Fleet Street · EC4*

FOR SALE: continued

600

CHEMICAL PLANT

HYDRO EXTRACTOR by Broadbent, fitted imperforate 42 in. diam. basket, Hydro fitted skimmer attachment. Three-point suspension. Motorized 400/3/50.

4 HYDRO EXTRACTORS by Cherry Tree, 30 in. diam., galvanised basket, driven by 5 h.p. 400/3/50 Motor, Fitted wire mesh cover with electrical interlock.

NO. 2 SWEETLAND FILTER PRESS by Dorr-Oliver, robust cast iron construction chamber 16 in. diam. by 36½ in. long. Capacity 18 leaves at 2 in. centres, at present fitted 12 leaves (31 sq. ft.). Hinged bottom exposing leaves. Maximum pressure 50 lb. sq. in.

FILTER PRESS, plate and frame type, by S. H. Johnson, 'D' type, 36 chambers, pyramid plates 2 ft. 8 in. sq., for 30 in. cake. Hand operated ratched screw closing. Individual chamber discharge and discharge trough.

EXTERNAL CALANDRIA TYPE VACUUM EVAPORATOR by Apex Construction, duty 50 gallons evap. hr. Comprising stainless steel Calandria 19 solid drawn stainless steel tubes 1 in. o.d. by 18 SWG. 3 ft. 7 in. long. Built for vacuum with 40 lb. steam pressure outside tubes. Stainless steel Vapour Chamber 28 in. dia. by 4 ft. 10 in. long for operation under vacuum. Copper Surface Condenser, area 100 sq. ft. 29 solid drawn copper tubes 1 in. bore by 16 SWG. two 50 gallon Copper Receivers and Vacuum Pump. Drive by 4 h.p. 400/3/50 Motor.

NEW STAINLESS STEEL STORAGE VESSELS AND TANKS, with capacities ranging from 8 gallons to 1,000 gallons.

NEW PORCELAIN AND SILEX LINED BALL MILLS, with capacities ranging from 9 gallons to 260 gallons.

GEORGE COHEN SONS & CO., LTD.
WOOD LANE, LONDON, W.12.
Tel.: Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel.: Pudsey 2241

SIMPLITE PUMPS are the World's Simplest, Lightest, Safest and Cheapest diaphragm type. 2 in. Suction completely self priming. Water, mud or chemicals. Petrol, Electric or Hand models from £20. Illustrated leaflet from the makers: **WM. R. SELWOOD LTD., 3 CHANDLER'S FORD, HANTS.** Phone 2275.

PAXMAN BRICK-SET ECONOMIC STEAM BOILER—14 ft. long by 7⅛ in. diam., 120 lb. pressure, 5/6,000 lb. evap. Cochran No. 8 **VERTICAL BOILER**—100 lb. pressure, 1,500 lb. evap.

GILLED STEEL STEAM TUBING—2¾ in. bore.

FYNA SWING HAMMER MILL and **CYCLONE.**

Hunt 2-sack **HORIZONTAL "U"-TROUGH MIXING MACHINE**

A. H. KIMMINS & SONS LTD.,
LYNDHURST ROAD,
WORTHING.

VACUUM OVEN, 4 ft. 7 in. by 3 ft. 3 in. by 3 ft. internal, with 3 Steam Heated Shelves. Quick clamping Balanced Door.

GARDNER SIFTER-MIXERS. Two H, 5 cwts. size.

KEK MILLS, Two No. 4 self motorised.

TILTING 'U' MIXER with Paddles, 7 cu. ft. capacity.

HOBART MIXER, 4-speeds, 80 qrt. removable Bowl.

MIXING PAN, 100 gallons, water jacket. Bottom Outlet or can be Tilted.

WINKWORTH MACHINERY LTD., 65 High Street, Staines. Telephone 1010.

Fully Automatic Packing Machine by 'SIG' Switzerland, type OCDS, for cartons 168×89×32 mm., speed 100 per minute. Reply: **BOX NO. C.A. 3504, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

NO. 15 BUELL ROTARY DRUM DRIER, 26 ft.×5 ft. dia., with High Efficiency Cyclone, Furnace, etc.

GEORGE COHEN SONS & CO. LTD.,
WOOD LANE, LONDON, W.12.
Tel.: Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel.: Pudsey 2241.

FOR SALE: continued

CHARCOAL, ANIMAL AND VEGETABLE, Horticultural, burning, filtering, disinfecting, medicinal. Also lumps, ground and granulated. **THOMAS HILL-JONES, INVICTA WORKS, BOW COMMON LANE, LONDON, E.3. (TELEPHONE: EAST 3285).**

NEW Pressed Steel Sectional Storage Tanks, 4 ft. square plates. Reasonable deliveries. Quotations for specific sizes on request.

WILLIAM R. SELWOOD LIMITED,
CHANDLER'S FORD, HANTS.
Phone 2275.

WANTED

INDUSTRIAL BY-PRODUCTS, LTD., 16, Philpot Lane, London, E.C.3. will be pleased to receive particulars of any by-products, waste materials and residues for disposal.

WORK WANTED & OFFERED

CRUSHING, GRINDING, MIXING and DRYING for the trade.
THE CRACK PULVERISING MILLS LTD.
Plantation House
Mincing Lane,
London, E.C.2.

GRINDING, CRUSHING AND GRADING
FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE: EYAM 227

PULVERISING of every description of chemical and other materials. Collections, storage, deliveries. **THOMAS HILL-JONES, LIMITED, INVICTA WORKS, BOW COMMON LANE, LONDON E.3. (TELEPHONE: EAST 3285).**

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers, Valuers and Fire Loss Assessors of
CHEMICAL WORKS PLANT AND MACHINERY
York House, 12 York Street, Manchester.

Telephone 1937 (2 lines) Central Manchester.

BUSINESS OPPORTUNITIES

EXPORT TO FRANCE. London Merchants being sole Agents of large British Manufacturer of pigments with successful sales record and office in Paris, invite correspondence from Chemical Manufacturers interested in selling their products on the French market. **WRITE BOX NO. C.A. 3503. THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

MISCELLANEOUS

WINE BREWED BY YOU. This **CHEMICAL AGE** has not offered equal perfection to **YEASTS** workings, converting **HIDALGO'S** Spanish Concentrated Grape Juices into delicious wines. Use: Revitalise bloodstream and effective relaxing medium. Hidalgo, Market Place, London W.1.

SAFETY FIRST

THE "OLDBURY" PATENT
CARBOY DISCHARGER
will empty and elevate up to 50 feet the contents of any carboy, bottle or vessel, and complies with all the conditions of the Factory Act of 1937.

KESTNER'S

5, Grosvenor Gardens, Westminster, London, S.W.1

● TEXTILE CHEMICALS

LAURYL PYRIDINIUM CHLORIDE

CETYL PYRIDINIUM CHLORIDE

Quaternary Ammonium Compounds of high surface activity.

● PHARMACEUTICAL CHEMICALS

BENZALKONIUM CHLORIDE
(Distributed by Bayer Products Ltd.)

CETYL DIMETHYL BENZYL AMMONIUM CHLORIDE

CETYL TRIMETHYL AMMONIUM CHLORIDE

CETYL PYRIDINIUM CHLORIDE

Quaternary Ammonium Compounds of high purity with outstanding Germicidal properties.

● COSMETIC CHEMICALS

STEBAC

An outstanding base for the hairdressing industry incorporating Stearyl Dimethyl Benzyl Ammonium Chloride. The corresponding Cetyl compound is also available.

● RUBBER CHEMICALS

ZINC DIETHYL DITHIOCARBAMATE
ZINC DIMETHYL DITHIOCARBAMATE
TETRAMETHYL THIURAM DISULPHIDE
TETRAETHYL THIURAM DISULPHIDE

Accelerators used in Foam rubber processing.

● ANTISTATIC CHEMICALS

HEATEX

A long chain Quaternary incorporating outstanding antistatic properties to plastics, synthetic fibres, etc.

ANTIMIDE

A fatty Ethanolamide with Quaternary groups particularly useful for discharging statis when processing Nylon.

INDUSTRIAL CHEMICALS

N. MONO ETHYL ANILINE

NN. DIETHYL ANILINE

We shall also shortly be introducing experimental quantities of the ring substituted Primary, Secondary and Tertiary Ethyl Anilines.

DYESTUFFS INTERMEDIATES

● ALKYL CHLORIDES

STEARYL CHLORIDE
CETYL CHLORIDE
MYRISTYL CHLORIDE
LAURYL CHLORIDE
BUTYL CHLORIDE

Intermediates for the manufacture of Amines, Quaternary Ammonium Compounds and Grignard compounds.

CHLORO-METHYL METHYL ETHER

A useful Chloro-Methylating agent and an intermediate in the manufacture of ion exchange resins.

para CHLORO-METHYL TOLUENE

At present in small scale production. A potential route to Terephthalic Acid.

ANHYDROUS HYDROCHLORIC ACID GAS

Solutions in various alcohols and ethers. Extremely useful materials for Esterifications and reactions involving the use of Anhydrous HCL and for the preparation of Anhydrous Amine Salts.

CHLORINATED COMPOUNDS

LEDA
CHEMICALS LTD

ELEY ESTATE, ANGEL ROAD, EDMONTON, LONDON N18

Cables and Telegrams LEDAKEM LONDON

Telephone EDMONTON 6322/3/4

Chairman with a chocolate complex

Creamy chocolate chippings for cold and clammy climates. How to transport them, how to keep them dry? Here's one chairman — one of many with different products, different problems—cured of his complex, quite painlessly, by Paper Goods. They prescribed 'Alkapaks'. These tough and durable polythene film sack- and drum-liners are sift-proof, moisture-proof, rot-proof. Made from 'Visqueen' polythene film in enough standard sizes to fit snugly in almost any sack or drum—or tailored specially for the awkward ones. Result? Perfect packaging, cheerful Chairmen!

For other knotty problems, Paper Goods supply gusseted and ungusseted bags and case-liners made from tubular and flat polythene film, cartons and display packs.

When it comes to packaging . . . Paper Goods take the load off your mind

To prove it, get in touch with:
PAPER GOODS MANUFACTURING COMPANY LIMITED
(A subsidiary of Imperial Chemical Industries Ltd.)
Westmead Road, Sutton, Surrey. Tel: Vigilant 8216

PG. 52

ACID & ALKALI
RESISTING LININGS
IN
BRICK, TILE, P.V.C.
&
RUBBER
FOR ALL TRADES

COMPLETE PLANTS
FOR PICKLING
FUME EXTRACTION
&
EFFLUENT
TREATMENT

PICKLING TANKS 90 FEET LONG WORKING SUCCESSFULLY

RIZISTAL

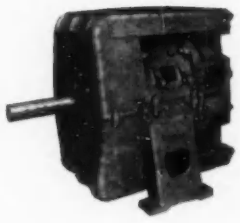
AN ALL BRITISH PRODUCT

RIZISTAL TRADE MARK

SOLE
MANUFACTURERS
OF
RIZISTAL BRAND
SILICA, LATEX,
CASHEW, FURANE, &
POLYESTER, RESIN CEMENTS
RIZISTAL, SKYMMIT & BRUSH-
ON IMPERVIOUS COATINGS
P.V.C. & STAINLESS STEEL
FABRICATIONS FOR ALL PURPOSES

JOHN L. LORD & SON
WELLINGTON CEMENT WORKS
TELEGRAMS: "CEMENT" BURY
PHONE: BURY 617
BURY, LANCASHIRE

No admittance...



...to dirt and dust,
acid splashes,
corrosive fumes in
gas works, boiler houses
and coke oven plants

...When you employ
Metrovick TECAC Motors

The illustration shows a Metrovick TECAC direct-current motor with integral fan-operated air cooling circuits.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER 17

Member of the A.E.I. group of companies

J/C001

Printed in Great Britain by THE PRESS AT COOMBELANDS LTD., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154 Fleet Street, E.C.4, 6 October, 1956. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.